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ELECTRICAL WORLD

APRIL 5, 1930
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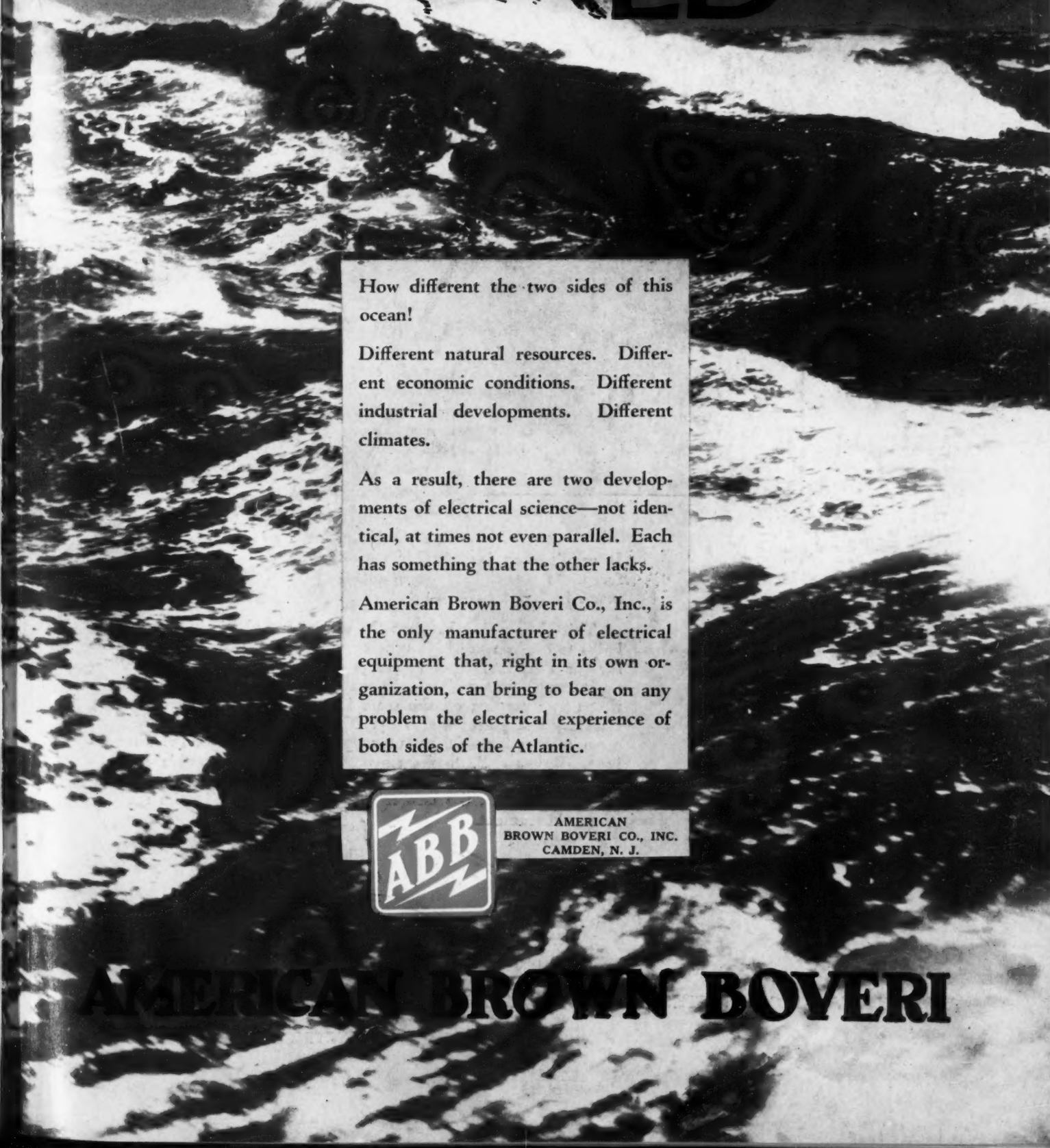

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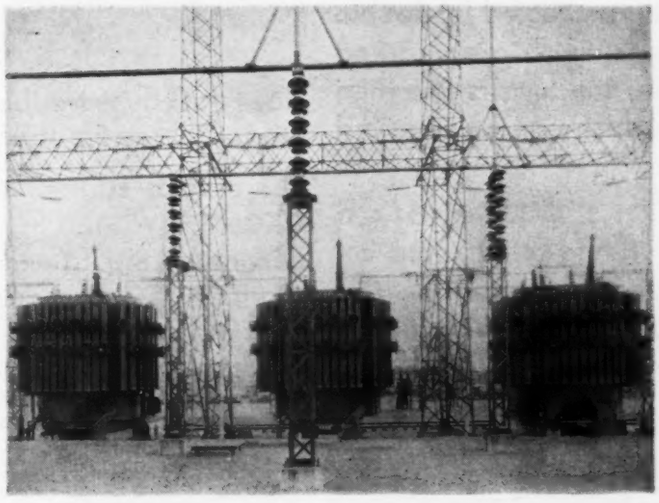

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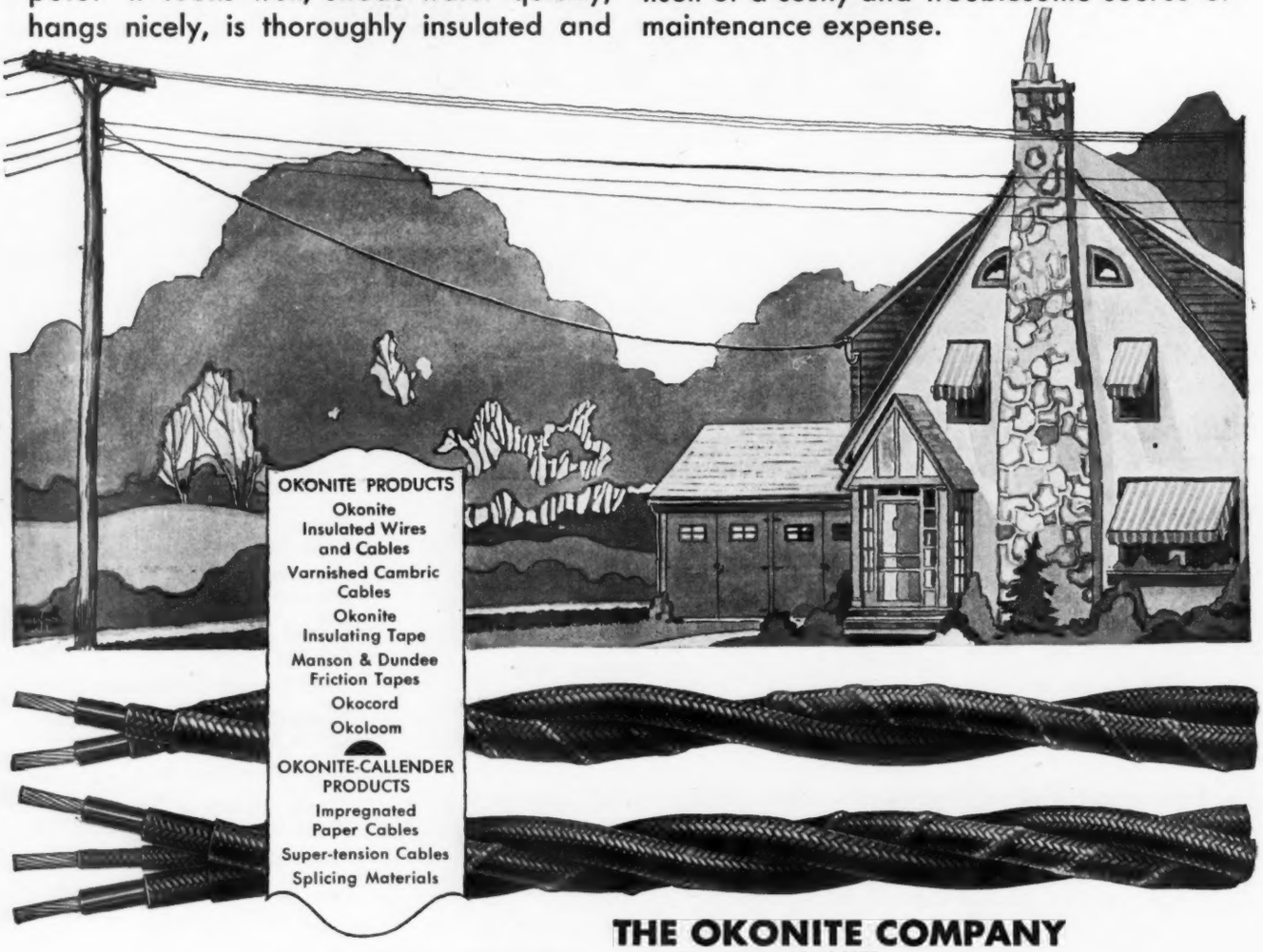

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ELECTRICAL WORLD

for the Week Ending

April 5, 1930

Comment On the News

WITH THE INAUGURATION of commercial radio-telephonic service from North America to three South American countries the globe perceptibly shrinks again. Hitherto oral transcontinental communication has been mainly along the lines of latitude; now it becomes longitudinal as well.

WATER-POWER MONOPOLY is an edict of nature. Man cannot duplicate the rivers and falls. Hence about thirty-five contemplated developments on the Colorado River, for which applications were pending before the Federal Power Commission, will be made impossible in whole or part if the Boulder Dam plans are carried out. The applicants are simply "out of luck."

POLITICIANS SAT UP and took notice when the spokesmen of the utility companies took vigorous issue at Albany with the majority bills to reconstitute the New York Public Service Commission. Legislative leaders may have thought that to escape the whirlpool which the minority members had stirred up in the sea of regulation the utilities would ask to be steered to the rock upheaved by their putative friends. But, with the ingratitude to be expected from "soulless" bodies, the companies displayed a purpose to shun Scylla no less than Charybdis.

SOUTH CAROLINA AND LOUISIANA have been added to the states where the establishment of uniform rate schedules in comparable cities and towns is a matter of agitation. Where the conditions are really the same the principle is a sound one.

STILL ANOTHER EXECUTIVE associated for many years and in the highest offices with the New York Edison Company has departed. Nicholas F. Brady never played a large part at association gatherings or on the stage of publicity. Those who knew him best attribute this fact to a genuine modesty, one of the characteristics that endeared him to his associates. Behind the scenes, in the realm especially of financial management, his great powers of organization, his large views which small things did not satisfy, and his courageous enterprise which scorned mere plodding, marked him as a leader whom it will be no easy task to replace.

NEWS OF THE WEEK

Nicholas F. Brady of New York Edison Dies at Fifty-one

GREAT loss came last week to the associated group of utility companies in Greater New York as well as to half a hundred other corporations through the death on Thursday of Nicholas F. Brady, formerly president and more recently chairman of the board of directors of the New York Edison Company.

Mr. Brady, who was less than 52 years of age, had been suffering from arthritis since last fall, but his condition did not become serious until the first of last week, when fatal complications arose. His death aroused intense regret in the world of finance and business, where he was regarded as a commanding figure, as well as in still wider fields of friendly association. He numbered among his intimate friends leaders in both political and ecclesiastical circles, fellow-devotees of art and many interested in philanthropic undertakings to which he gave generously but without ostentation.

Born in Albany on October 25, 1878, Mr. Brady, after education at Albany Academy and Yale University, started to follow the footsteps of his father, Anthony N. Brady, who had risen from an inconspicuous station in Albany to control the fortunes of electric, traction, gas and other utilities capitalized at many millions. Nicholas Brady inherited his father's genius for organization and expanded the many interests of the latter even further.

The son's first connection was with the New York Edison Company, where he started to learn the public utility business to which he had been destined. In a few years he was made treasurer and then vice-president. An early assignment recorded was with the Tennessee Electric Power Company in which his father is said to have invested much money but which it remained for the son to put upon its feet.

Nicholas F. Brady

In 1913, when the elder Brady died, the son became president of the New York Edison Company, and with his brother, James Cox Brady, who died in 1928, assumed administration of the huge estate. After completion of the subway from Brooklyn to Manhattan, in which their father had a large part, they sold their interests in traction activities and devoted themselves to gas and electric light and power. Besides his New York City interests, the son was prominently connected with the Mohawk-Hudson Power Corporation and its upstate subsidiaries. At the time of his death he held the post of director in more than forty organizations, including national banks and copper-mining corporations.

The culmination of Nicholas Brady's career came in August, 1928, when, largely, it is believed, as the outcome of his work, the Brooklyn Edison Company and the New York Edison Company were merged, taking with them the United Electric Light & Power Company, the New York & Queens Electric Light & Power Company and the Westchester Lighting Company. Mr. Brady became chairman of the board of the amalgamated group, the stock of which was held by the Consolidated Gas Company.

In addition to his New York interests Mr. Brady continued enterprises begun by his father in Japan and with the co-operation of the Japanese government established modern lighting systems in Tokyo and Osaka. He helped to form the American Brown-Boveri Corporation in Belgium and was instrumental in expanding it to America. He was a chief adviser on matters of electricity to the Italian government in its successful efforts to develop the water-power sites of northern Italy.

Mr. Brady was the recipient of several Papal decorations. During the World War he served in Italy as a major with the American Red Cross for almost a year. He was an associate of the American Institute of Electrical Engineers and belonged to numerous societies and clubs of various kinds. For 25 years before his death he was a member of the executive committee of the National Civic Federation, evincing much understanding of labor problems that this body was instrumental in adjusting and a wide sympathy with reasonable and well-founded contentions put forth by trade union leaders. He leaves a wife, who was Miss Genevieve Garvan.

Tributes from leaders in the utility world

Although once a member of the public policy committee of the National Electric Light Association, when he helped to draw up a report on the relations between labor and capital which embodied many of the welfare features that he had already introduced into his own company, Mr. Brady shunned office and the rostrum and preferred to play an inconspicuous part in electrical and other utility gatherings. The high esteem in which he was held, notwithstanding this modesty, is shown in the following tributes from fellow-executives:

MATTHEW S. SLOAN, president N.E.L.A. and New York Edison Company:

> Mr. Brady's death seems to me to be little less than a tragedy. He was only in early middle age, and he was a vital and constructive force in so many great enterprises that his loss will be felt tremendously. His place in the business world will be hard to fill. A man of unconquerable modesty, keeping himself in the background whenever possible, Mr. Brady was nevertheless a man of strong convictions and striking initiative

and courage. He was thoroughly trained from early manhood in large affairs and was clear-visioned and straight-thinking. Having decided what was right in any situation, he could not be swerved from his stand by other considerations. He was intensely loyal to his friends and business associates and was respected, admired and loved by all who came into close contact with him. I have lost a very dear friend.

GEORGE B. CORTELYOU, president Consolidated Gas Company:

The death of Mr. Brady will be deeply felt by his friends and associates. While yet a comparatively young man, he had reached a position of great influence in the financial and industrial life of this community and of the country at large. Association with him will abide with us as a cherished memory.

GERARD SWOPE, president General Electric Company:

In the death of Mr. Brady the electrical industry has lost a man of outstanding ability, very quiet in his methods and modest in his statements, but, withal, persistent in carrying out his constructive ideas for the upbuilding of the industry for the good of the public which it served and for increasing its usefulness by expanding the scope of the service it rendered.

JOHN J. O'BRIEN, president H. M. Byllesby & Company:

The passing of such an outstanding business leader as Nicholas F. Brady is a distinct public loss. He was a man of unusual ability and understanding, with the highest of ideals and principles. He held the admiration and affection of all who knew him.

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Norris Brings up Shoals Bill in Senate —Power Commission Doings

COMPARATIVE quiet has prevailed in Washington this week as regards political activities affecting utility companies. Muscle Shoals has just taken the Senate floor. Various matters have occupied the attention of the Federal Power Commission.

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Senator Norris dwells on lobbying and its effect

Unless all the political forecasters in Washington are mistaken, the Norris bill for government operation of Muscle Shoals probably will have passed the Senate or will be in shape for an early vote by the time this account is in print. Possibly the Black amendment for private leasing of fertilizer properties will be appended. Senator Norris began on Wednesday, April 2, to present the great mass of arguments saved up since his bill passed the House and Senate in the Coolidge régime and was killed by pocket veto. With a crowded gallery and an almost deserted floor, he began by rehashing the lobby committee findings. Lobbying efforts of the Cyanamid and Union Carbide companies have destroyed the standing of these firms as potential lessees, the Nebraska Senator thundered.

Once past the Senate, the Norris bill is felt to be due for defeat in the House or, if not that, for a Presidential veto. Meanwhile the House committee on military affairs is carrying on its hearings with the idea of advancing its idea of a proper settlement. Of the bills under consideration, the Wright bill, embodying the Cyanamid offer, seems to have good chances with the committee.

Newton W. Gilbert, ex-Governor of the Philippines, in Wednesday's session, assured the committee that the Farmers' Federated Fertilizer Corporation, an applicant for Muscle Shoals power, could muster $10,000,000 to start after the project got under way.

The Muscle Shoals phase of the Senate lobby committee's probe is virtually at a close. Chester H. Gray of the Farm Bureau Federation was once again before the committee on April 1 and said he meant to work more aggressively for private control—doubtless meaning the Cyanamid offer.

William B. Bell, president of the American Cyanamid Company, testified on Wednesday that his firm spent $168,706 in connection with its Shoals offer, mostly for legal services.

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Power Commission takes up the accounting controversy

Federal Power Commission hearings were held on the Saluda and Safe Harbor projects. In the former case the Lexington (S. C.) Water Power Company was called upon to support pre-license charges which are in question, as brought out before the Couzens committee. Accountant King and Solicitor Russell are having a chance to make their case against the company. The company set its pre-license costs at $1,249,470, but the commission accountants cut the figure to $837,275.

One of the items eliminated by the commission is of $300,000 for services of two companies, according to Mr. King. The item was eliminated on the ground that it does not represent actual, legitimate cost of construction. Another item inserted in the company's cost statement and struck out by the commission covers $135,000 for the cost of acquiring a water-power site on Saluda River known as Drehrer's Shoals. A third item eliminated is one of $10,007 for interest on notes of the Lexington Water Power Company for advances made between June 5, 1926, and July 26, 1927, for acquisitions of lands and flowage rights.

In the protest lodged with the commission by the Lexington Water Power Company it is asserted that the items referred to represent actual expenditures necessarily incurred and are reasonable and legitimate items of pre-license cost.

When the hearing began the in-

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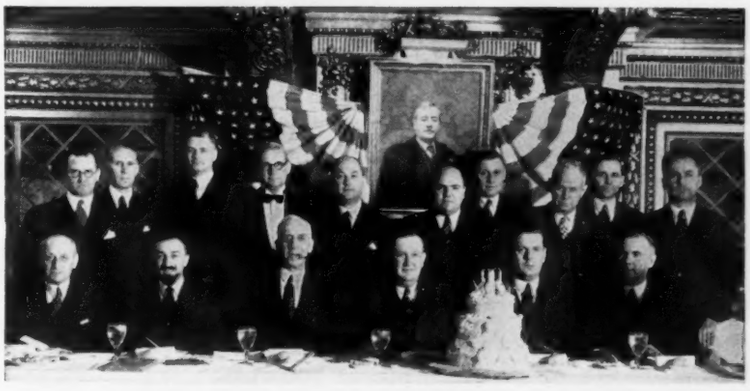
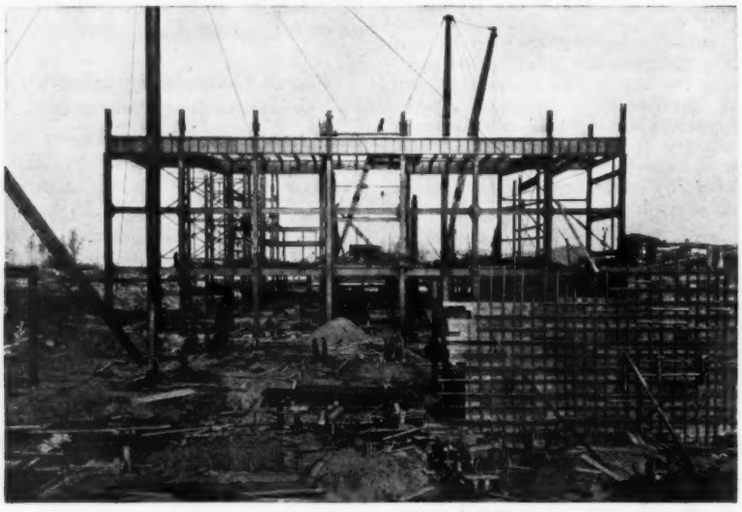
BYLLESBY ENGINEERS' "KING ROW"



The three hundred in attendance at the fifth annual convention banquet of the engineering department of the Byllesby Engineering & Management Corporation in Chicago, March 24 to 26, were headed by this group at the speakers' table.

Left to right: Standing, P. O. Crawford, H. W. Eales, W. O. Batchelder, John L. Gray, O. G. Corns, E. Uhlendorf, A. C. Bull, Judge R. M. Campbell, H. S. Bennion and C. W. Farrier; seated, General Charles Keller, Johnson O'Connor, H. W. Fuller (chairman of the convention), A. C. Allen, H. C. Cummins, and F. H. Lane.

MICHIGAN CITY PLANT RISING IN DUNES



The Michigan City generating station of the Northern Indiana Public Service Company is taking skeleton form. Steel for the building that will house the first unit of 64,000 kw. is going up at the rate of 65 tons per day

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vestigation immediately struck complications when records of W. S. Barstow & Company were requested. The Lexington company is controlled by the General Gas & Electric, the Barstow company, now consolidated with the Associated Gas & Electric Company. To determine a question of management fees, certain books of the Barstow firm are being sought through a subpœna. This postpones further action till April 24.

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Wilbur tells status of commission business

Speaking for the Federal Power Commission, Secretary of the Interior Wilbur, its acting head, announces that when the commission acted on the Safe Harbor project in Pennsylvania it virtually cleared its docket of license applications contemplating large projects. There are now 50 major license applications pending, but action is necessarily held up on nearly all of these for one reason and another. There are four, for example, that are awaiting international agreements, four dependent on state co-operation, ten under investigation in the field, seven awaiting information from the applicant, and so on. There are only four major applications now before the commission on which decisions are imminent. Two of these are awaiting further study of pre-license costs and one an understanding with the state in which it is located. On the fourth, the Flathead Lake project in Montana, there is a conflict between two applicants.

The Secretary of the Interior further announced that the Governors of Utah, Colorado, New Mexico and Wyoming are being notified that the Federal Power Commission is proposing to consider applications for power permits in the Colorado River basin. This action concerns applications for permits and licenses for the development of 44 power projects in that field, nineteen of them on the Colorado River, four on the Green River, and the remainder on tributaries in Colorado, Utah and Arizona. The issue of licenses in this area was discontinued in 1927, subject to the development of the Boulder Dam project. When the Boulder Dam act became effective on June 25, 1929, legislative restrictions on the commission were removed. Action on applications for authorizations in the area were further withheld, however, at the request of the various states involved.

Enactment by the Kentucky Legislature of two laws designed to bring about the acquisition by the state for park purposes of the land surrounding Cumberland Falls, most of which is now owned by the Cumberland Falls Power Company, has led Secretary of the Interior Wilbur to ask Attorney-General Mitchell for an opinion concerning the status of that company's application to the commission for a license to develop the site. The Attorney-General of Kentucky has petitioned the commission to deny the application. The applicant company contends, however, that the recent state legislation does not estop the company from proceeding with the project and urges that the commission should either grant the license application or make a finding of no jurisdiction.

Minority Utility Bills Put Before N. Y. Legislature

PREVIOUS to the public hearing on the various measures to amend the New York Public Service Commission law submitted by the legislative commission on that matter, the minority members—the Governor's appointees—submitted five bills of their own designed to give expression to the chief policies on which they differed from the Republican members.

Bill No. 1, the most important bill, sets up a new policy and method for rate making based upon a legislative finding that regulation in the matter of rates has "completely broken down owing to vague, indefinite and highly variable standards of rate bases, rates of return and rate making which have been laid down by the courts." It sets up a bureau of valuation in the department of public service which is to be charged with the duty of making a complete state-wide initial valuation of existing property of all utility companies, the expenses to be paid by the public utility companies themselves. This initial valuation of existing property is to be made by examination, including actual physical inspection where deemed necessary. The bureau is to hold public hearings, and the burden of proof is put upon the contestant.

Once the initial valuation has been made and confirmed by the commission, it shall not be subject to a revaluation and shall be binding upon the public utility companies for all time, subject only to depreciation, the amount of which is definitely prescribed in the bill. Each new property acquired by the public utility is to be valued only at the actual uninflated cost thereof. Restrictive provisions are made for accumulation and accounting of the depreciation reserve. The rate base for any utility at any time is to be the sum of the initial valuation plus the actual cost of new property less the approved reserves, and the company is directed so to keep its accounts as to show the rate base as existing at any time. The rate of return is to be determined by the commission and shall thereafter remain fixed except as provided by a rate-equalization reserve. In fixing rates the company shall be permitted to earn only sufficient revenues to pay (1) actual and reasonable operating expenses, including depreciation and other operating reserves approved by the commission; (2) taxes; (3) other charges incurred with the approval of the commission, and (4) the return allowable.

Bills Nos. 2, 3 and 4 are alternative measures with the same general aims as No. 1. Bill No. 5 permits municipalities to construct and acquire and to operate public utility plants, after referendum to the voters.

Albany Now Is Scene of Hearings Affecting Utility Companies

WITH the St. Lawrence power commission bill signed and applauded by the Governor of New York, who is soon to announce his appointees, the Albany legislators went ahead this week with the public hearings on the bills drawn to carry out the recommendations based on the recent legislative inquiry into Public Service Commission laws by the Knight commission. That many of these bills will have to be materially amended to correct errors and eliminate unworkable conditions was indicated. All of the major bills were severely attacked on Monday by William L. Ransom, counsel for the Consolidated Gas Company of New York, and other utility counsel.

Judge Ransom declared that the bill regulating the issuance and sale of stock and short-term financing of public utilities, which provides that notes for not more than twelve months must have the approval of the commission where they aggregate, together with all other outstanding notes and evidences of indebtedness, more than 5 per cent of the stated value of the securities of the corporation then outstanding, would paralyze the ability of public utilities to carry on business at all by adding enormously to the cost of money.

The bill providing for a state-wide valuation of public utilities, the bill to stabilize valuations and rate base by contract and the bill to control holding companies were others against which Judge Ransom directed especially emphatic condemnation. He summarized his criticisms of the bills in general terms as follows:

1. They would impose heavy burdens upon taxpayers, including these companies, and add greatly to the cost and complexity of the state government.
2. They would greatly discourage public utility investments and holdings, and the carrying on of transactions with utility companies, thus creating new hazards and adding to the cost and difficulty of obtaining money for needed additions and extensions, all of which will not make for the best public utility service, but will add substantially to the cost of service to the consumer.
3. They would inevitably be unfair in operation and discriminatory in their treatment of utilities and their investors, as compared with other corporations and investors: they would vest vast powers in public officers and then charge those officers with the duty of a one-sided, arbitrary representation of customers as against investors and companies instead of fair and impartial treatment for both.
4. The conditions against which the bills appear to be in large part directed are the decisions of the highest courts rather than abuses or excesses on the part of utility companies; and the bills appear, in many instances, to have been formulated for the purpose of reversing or avoiding the effects of well-considered judicial decisions as to the fundamental rights of persons and of property.

These objections apply alike to many of the provisions in bills recommended by the majority and bills recommended by the minority. We cannot believe that provisions which would have these effects can be in the interest of customers, taxpayers, investors or any one else.

Norman Thomas, chairman of the legislative committee of the Socialist party, spoke in favor of the minority bills as being a step toward public ownership, while Frank P. Walsh expressed the views of the minority membership of the Knight commission.

On Tuesday Dr. John Bauer advocated the minority proposals for a permanent initial valuation of utilities, with additions at actual cost. Prof. J. C. Bonbright, one of the Governor's appointees on the commission, also supported the minority plan. Randall J. Le Boeuf, Jr., attorney for the Niagara-Hudson Power Corporation, attacked all the major bills as unworkable and said that the contract proposal was loaded with provisions that would prevent any company from seeking to take advantage of it. He proposed a simple bill in place of the bill of the commission in which the right to enter into contracts would be given to the commission and the power to order a valuation if needed.

At Wednesday's session spokesmen for the State Conference of Mayors, which had gone on record as asserting that the majority bills were "full of jokers," attacked both the "contract" rate plan of the majority and the "frozen value" rate plan of the minority, as well as short-term valuations. They approved the minority proposal to allow cities to acquire and operate utilities and suggested amendments to confine such operation to municipal limits and to withhold from counties the privilege of utility ownership.

Judge Ransom spoke again, denouncing the majority submetering bill as a design to perpetuate the "uneconomic middleman" in the electrical industry. The bill limits submeter rates to the amount of the utility rates and would, Judge Ransom contended, rob New York City consumers of a rate reduction reaching $14,000,000.

Bending to some of the criticism and suggestions made by the utilities, but unyielding to the hostility toward his contract bill, Senator Knight approved scores of amendments to his measures. The hearings were scheduled to end Thursday. Whether the majority bills will be rushed through in the few remaining days of the legislative session remains to be seen.

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ENERGY GENERATED UNDER FROWNING ALPS

The new Swiss power station at Handeck develops 75,000 hp. from the stored headwaters of the Aar

H. C. Spurr Defends State Commissions

DEFENDING public service commissions against the charge that they have changed from bodies where public interests were defended to one-sided judicial bodies where powerful utilities have things much their own way, Henry C. Spurr, editor *Public Utilities Fortnightly*, told the Maryland Utilities Association, which met at Washington on March 28 for its annual convention, that the commissions' attitude has not changed. They never deemed themselves courts, he said, but since it is incumbent upon them to decide facts they have in so doing endeavored to act in a judicial rather than a partisan manner.

Governor Ritchie of Maryland, in addressing the convention, alluded to the questions arising from interstate transmission of energy. Another speaker was Merle Thorpe, editor *Nation's Business*, who attacked "the spread of paternalism and bureaucracy in the federal government" as a "frontal attack on America's industrial system."

R. E. Town was elected president in succession to H. A. Brooks, Adrian Hughes was elected vice-president, F. A. Mitchell treasurer and D. E. Kinnear re-elected secretary.

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Submetering Company Forbidden to Exact Deposit

DEFINITION of the rights of a tenant in an apartment house where the electric service is submetered and not furnished by the electric utility company was given last week in the New York Supreme Court, in the Borough of the Bronx, in the case of Leon London vs. Economy Electric Meter Company, New York Edison Company and West Kingsbridge Road Corporation. In this case the plaintiff's landlord installed a submetering company and refused to permit the tenants to procure their electric service directly from the New York Edison Company.

The Economy Electric Meter Company demanded an advance deposit of $10 from the plaintiff, and when this was refused the landlord and the submetering company cut off London's light.

The court, in granting a preliminary injunction against the Economy Electric Meter Company, and denying it as against the New York Edison Company, which was not shown to be involved, did not pass upon many of the questions at issue. It held that the tenant in an apartment house is entitled to receive electric service and that if the landlord installs a submetering concern to supply such service, the service cannot, in the absence of specific provision to that effect in the lease, be refused or discontinued because the tenant declines to put up a deposit with the submetering concern.

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Radio-Telephone Service to South America Now

REGULAR telephone service between North America and South America became available to the public over the American Telephone & Telegraph Company's radio-telephone circuits on April 3. The new service interconnects twenty million telephones in the United States, as well as all the telephones in Cuba and all the principal points in Canada and Mexico, with Buenos Aires and the Argentine generally and with the cities of Santiago, Chile, and Montevideo, Uruguay.

The link between the two continents is a short-wave radio-telephone circuit 5,300 miles in length connecting the overseas radio stations of the A. T. & T. in the United States with the International Telephone & Telegraph Corporation's stations in the vicinity of Buenos Aires. There is a single talking circuit composed of two radio channels, one for northward and one for southward transmission. Excellent results are reported from the preliminary trials, more favorable average ether conditions than exist on the transatlantic circuits having been encountered.

Sloan Makes Reply on Coal Surcharge

COMPLAINT filed with the New York Public Service Commission against the former coal surcharge of the associated light and power companies in Greater New York has elicited a formal reply from M. S. Sloan, their president. Quoting figures to support his statement, Mr. Sloan says, in part:

> The fact is clear, and shown beyond peradventure, that this adjustment charge yielded to these companies substantially less of compensatory revenues than they were fairly entitled to receive, and that if the coal surcharge had contemporaneously been construed or readjusted to yield still less revenues than it did, the companies would have been compelled to increase their revenues, to an equivalent or great extent, through a vertical, flat increase in their rates per kilowatt-hour.
>
> If the commission had not authorized the flexible feature of this surcharge as a part of the rate, the New York Edison Company and other companies would have been compelled to exercise their right, clearly reserved before the commission on June 27, 1917, to advance their base rate at least 1 cent per kilowatt-hour. The surcharge was in lieu of a flat raise in the rates.
>
> Understanding of the matter will fail if it is not at the outset clearly perceived that the surcharge is merely a part of the rates, a method of obtaining absolutely essential revenues, which would inevitably have been obtained from a flat and non-flexible increase in the base rates if they had not been obtained through this flexible and relatively temporary method.

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A Uniform Rate Theory to Be Tested in Indiana

MAINTAINING that all cities of similar classification served from the same combined "pool" of power should be placed on the same rate basis, the Wabash Valley Electric Company, an Insull-owned utility, is resisting a rate reduction granted by the Indiana Public Service Commission to the residents of Martinsville, served by the utility named. The theory advanced by the company will affect 217 towns and cities if it is upheld and the seventy-million-dollar Insull merger is granted. This is said to be the first court test of the contention, and efforts will be made to have the federal court in Indianapolis reach a decision by June.

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South Carolina Consumers Form Rate Association

FORMATION of the South Carolina Electric Power Consumers' Association is reported from that state. It demands that rates "shall be made fair, equitable and uniform." The decision

to organize a state-wide association followed a presentation by Senator Edgar A. Brown of Barnwell to a meeting of citizens from every district of the commonwealth, held at Columbia, of statistics purporting to show a wide variance in the rates charged for energy in South Carolina and also that the rates were higher than in other states. An executive committee was appointed with authority to engage engineers and counsel.

The South Carolina House of Representatives has passed a bill to require utility companies to furnish all information and reports required by the Railroad Commission of the state in carrying out a provision in the appropriation bill allotting to the commission $25,000 for an investigation of power rates in South Carolina.

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Louisiana Commission to Investigate Utility Rates

REPRESENTATIVES of virtually all the electric and gas interests of Louisiana outside the city of New Orleans met recently with the Louisiana Public Service Commission and were requested to furnish the commission within thirty days with detailed information as to their operations, the value of their property and other data having a bearing on the utility rates charged in the state.

After the commission has gone over the information submitted by the companies, it was announced by Chairman Francis Williams, a series of public hearings will be held in all parts of Louisiana to give the people of the state an opportunity to present their views.

The main purpose of the investigation, according to the commissioners, will be to disclose such discrepancies in rates as may exist between communities similarly located and to bring about a more uniform level in the rate structure. The commission, said Chairman Williams, will at the same time keep in mind the necessity for a fair rate of return to the companies.

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Projects Overshadowed by Boulder Dam Act

THOUGH the Boulder Dam act lifted the ban of Congress against the granting of water-power applications on the Colorado River and its tributaries, the Federal Power Commission has continued to keep all of these projects under suspension until the entire situation can be appraised. The commission now has decided to proceed actively with the determination of the status of these projects. Licenses will be issued to constructed and run-of-stream plants where no controversy is involved, and 90 days will be given for all applicants for sites on the main river and on the tributaries between Green River and the Gila to show why the project should be continued in good standing. It will be necessary for such applicants also to establish that their project will not interfere with the Boulder Canyon development and the best scheme of future additional development.

Certain projects will be in direct conflict with the Boulder project. In that category the following projects apparently fall:

Number	Name	Horse-power	State
231	J. B. Girand ..	130,000	Arizona
238	Los Angeles. ..	800,000	Ariz. and Nev.
258	So. Cal. Edison.	1,200,000	Ariz. and Nev.
392	G. H. Stetson.	1,600,000	Ariz. and Nev.
875	State Inst's, Ariz.	340,000	Arizona

In addition, units of the following projects fall in that category:

Number	Name	Horse-Power	State or Site
59	El L. Beyard..	1,800,000	Ariz. and Nev.
111	So. Cal. Edison.	3,300,000	Ariz., Nev. & Utah
265	G. P. Mohler...	400,000	Ariz. and Nev
660	F. T. Coulter....	3,000,000	Arizona
837	Arizona Edison.	19,000	Mouth of Gila

Other projects will have to establish that they will be able to market the product in competition with Boulder Dam power. The project of James B. Girand at Diamond Creek will have to be considered in connection with the proposed Bridge Canyon dam, which would flood out Diamond Creek. Special consideration also will be given the Flaming Gorge project of the Utah Power & Light Company, which the commission at one time was prepared to license.

Still other projects which fall in one of the two categories mentioned are:

Number	Name	Horse-power	State or Site
30	Beckman & Linden Corp. . . .	200,000	Arizona and Cal.
158	Utah Pwr. & Lt.	100,000	Green River
230	J. B. Girand ..	130,000	Arizona
279	Utah Pwr. & Lt.	800,000	Green&Yampa R.
301	C. N. Stannard	57,000	Colorado
391	G. H. Stetson.	168,000	Ariz. and Nev.
425	John L. Fish..	24,000	Salt River
500	Western Col. Pr.	17,500	Animas, San Miquel and Uncompahgre Rivers
524	A. E. Humphreys	120,000	Green River
630	Ida M. Butts....	.....	Eagle Creek
647	Los Angeles. ..	200,000	Ariz. and Cal.
661	State Inst's, Ariz.	1,000,000	Arizona
668	So. Cal. Edison.	180,000	Ariz., Cal. & Nev.
741, 767	J. Whittman..	9,000	Various streams
770	State Inst's, Ariz.	750,000	Col.&San Juan R.
808	State Inst's., Ariz.	200,000	Colo. River.
842	R. D. Webb....	3,300	Gunnison R., etc.
854	A. E. Humphreys	11,500	Brush Creek
857	R. D. Webb....	26,000	Gunnison R., etc.
924	State Inst's, Ariz.	70,000	Little Colo. R.
953	J. B. Girand ..	6,000	Salt River
967	J. B. Girand ..	23,000	Salt River
968	J. B. Girand ..	33,000	Salt River
1,003	Un'd Verde Cop.	82,000	Little Colo. R.
1,062	Ariz. Wtr. Con.	6,700	Hassayampa R.

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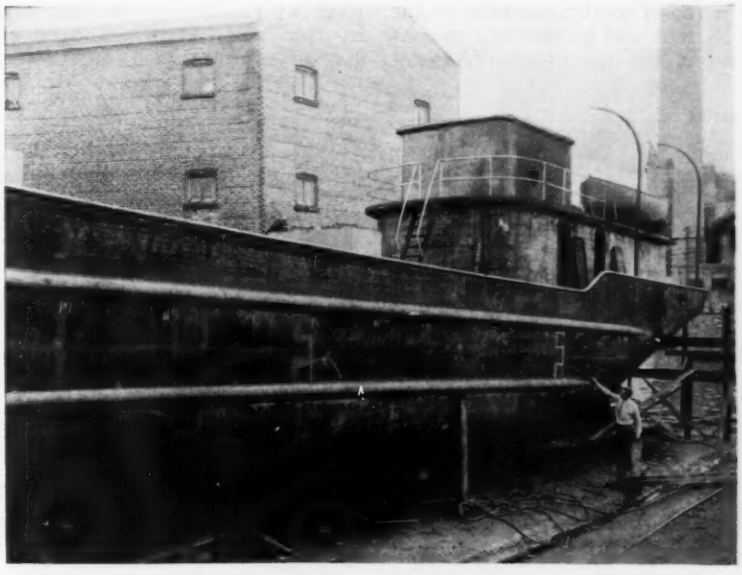
FIRST ARC-WELDED CARGO SHIP



The first rivetless cargo vessel, a 2,500-barrel oil tanker, has just been launched in the shipbuilding yards of the Charleston Dry Dock & Machine Company, Charleston, S. C. The vessel, 120 ft. by 23 ft., with a 10-ft. draft, was constructed entirely by the arc-welding method under a new system. One acetylene cutting torch and one General Electric arc-welding machine were employed. Only nine workmen were required.

City-Plant Tax Exemption an Issue in Washington

TAXPAYERS throughout the western part of the State of Washington have filed demands with the state tax commission, which is seeking to revise the tax system, to provide some relief for real property by the taxation of municipal utilities. There is a movement to oppose Seattle and Tacoma in their municipal ownership programs, especially the power and light systems, the complaint being that the two cities are lowering power and light rates at the cost of higher taxes to other counties and to privately owned real estate within the two cities themselves. As previously intimated (ELECTRICAL WORLD, March 15, page 524), the commission may provoke a fight by recommending the taxation of municipal utilities.

Whatcom and Skagit Counties have a special grievance against Seattle, which, those recommending taxation of the city's plants say, invaded their territory to confiscate power sites and condemn farms for the Skagit River hydro-electric project—all without the payment of taxes. The main works of the Skagit project lie almost wholly in Whatcom County.

Delay appears to be in store for Councilman Philip Tindall's proposed ordinance to provide for the purchase of the Puget Sound Power & Light Company's local distribution system and part of its power-plant equipment, with the idea of operating it in conjunction with the city lighting plant. Opposition has been raised to the purchase of the private system, and particularly to consideration of this move before councilmen recently elected are installed on June 2. It is estimated it would cost at least $9,000,000 to acquire the power company's Seattle holdings.

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Wisconsin Water-Power Report Ready Soon

LONG delayed, the report of the Wisconsin legislative committee on water power will be printed for distribution within 30 days. The report contains an elaborate brief favoring public ownership of utilities in Wisconsin, prepared by Carl D. Thompson, of the Public Ownership League of America; Theodore Kronshage, president of the Wisconsin League of Municipalities, and Charles Hammersley of Shorewood, Wis. The report has been held back nearly two years because of the division in the committee, three of the members favoring public ownership and two favoring private ownership.

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Transportation Plans for N.E.L.A. Convention

RAIL travel all the way and rail travel combined with transportation by water or by air will provide Eastern delegates and visitors to the National Electric Light Association's annual convention at San Francisco on June 16-20 with a choice of means for reaching the Pacific Coast. The association has already arranged for the special trains on which the majority usually travel and has, besides, made special arrangements for the leisurely who like to voyage and the adventurous who want to fly. The special trains comprise one (the "red special") making the round trip, two running west only and two running east on the return journey. Full details were printed in the *N.E.L.A. Bulletin* for March. The map gives routes, dates and times of, leaving New York and Chicago and reaching and leaving San Francisco.

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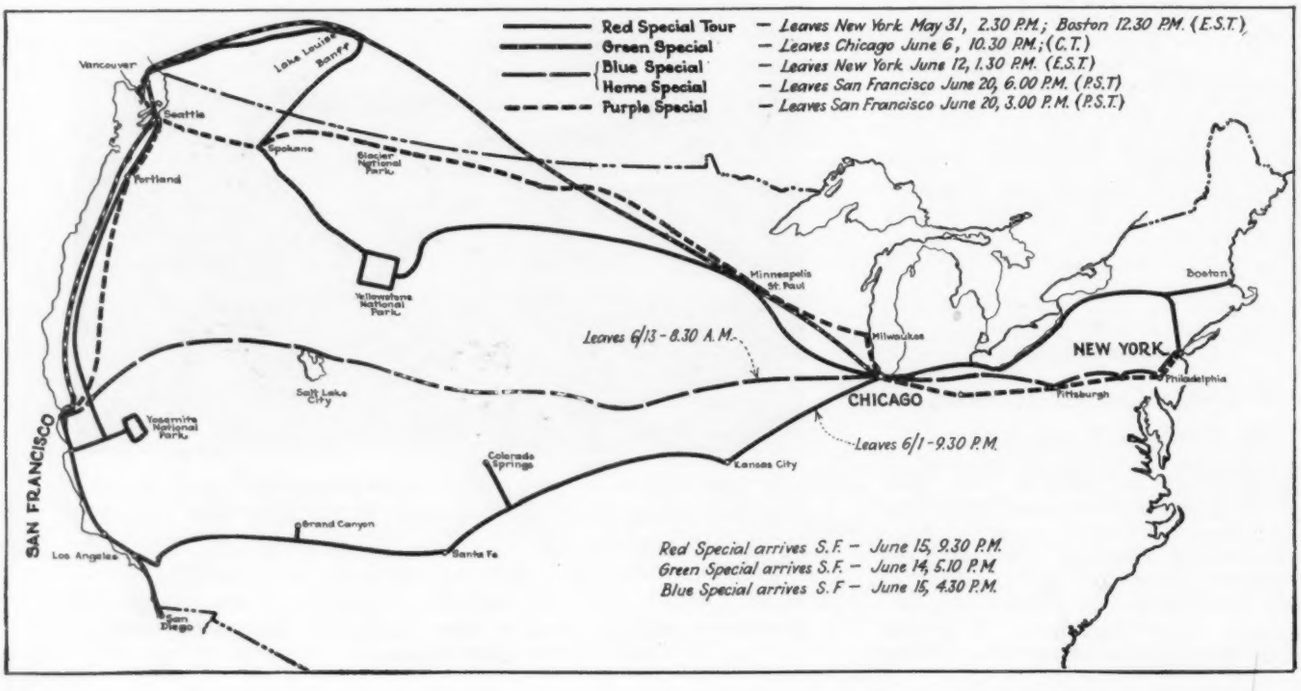
Canada 1928 Exports Near 1,500,000,000 Kw.-Hr.

DURING 1929 thirteen Canadian power companies exported 1,444,208,440 kw.-hr. to the United States. Compared with the total production this figure represents less than 10 per cent. Nearly 300,000,000 kw.-hr. of the amount exported was surplus production from the Niagara plants of the Ontario Hydro-Electric system and the Canadian Niagara Power Company. The Cedars Rapids Manufacturing & Power Company, controlled by Montreal Light, Heat & Power Consolidated, is the largest private power exporter, its exports last year totaling 431,481,998 kw.-hr. The total exports of the Ontario Hydro, including surplus production, were 687,305,992 kw.-hr. Exports of the other companies, aside from the Ontario & Minnesota and Maine & New Brunswick Power companies, are small. Fraser Companies export 7,321,500 kw.-hr. to the United States, but this power is used to operate its plant at Madawaska, Me.


Red Special Tour — Leaves New York May 31, 2.30 P.M.; Boston 12.30 P.M. (E.S.T.)
Green Special — Leaves Chicago June 6, 10.30 P.M.; (C.T.)
Blue Special — Leaves New York June 12, 1.30 P.M. (E.S.T.)
Home Special — Leaves San Francisco June 20, 6.00 P.M. (P.S.T.)
Purple Special — Leaves San Francisco June 20, 3.00 P.M. (P.S.T.)
Vancouver
Lake Louise
Banff
Seattle
Spokane
Glacier National Park
Portland
Yellowstone National Park
Minneapolis St. Paul
Boston
Leaves 6/13 - 8.30 A.M.
Milwaukee
NEW YORK
Salt Lake City
CHICAGO
Philadelphia
Pittsburgh
Yosemite National Park
SAN FRANCISCO
Leaves 6/1 - 9.30 P.M.
Colorado Springs
Kansas City
Grand Canyon
Los Angeles
Santa Fe
San Diego
Red Special arrives S.F. — June 15, 9.30 P.M.
Green Special arrives S.F. — June 14, 5.10 P.M.
Blue Special arrives S.F. — June 15, 4.30 P.M.

Coming Meetings

Southeastern Division, N.E.L.A.—Bon Air-Vanderbilt Hotel, Augusta, Ga., April 15-17. C. M. Killian, 207 Bona Allen Bldg., Atlanta, Ga.

Arizona Utilities Association (with Pacific Coast Electrical Association)—Arizona Biltmore Hotel, Phoenix, April 16-19. J. S. Arnold, 300 West Washington St., Phoenix.

American Welding Society—New York, April 23-25. M. M. Kelly, 29 West 39th St., New York.

Great Lakes Division, N.E.L.A.—Engineering Section, Detroit-Leland Hotel, Detroit, April 23-25. T. C. Polk, 140 South Dearborn St., Chicago.

Middle West Division, N.E.L.A.—Fort Des Moines Hotel, Des Moines, Iowa, April 23-25. Thorne Browne, 1527 Sharp Bldg., Lincoln, Neb.

Empire State Gas and Electric Association—Accounting Section, Briarcliff Manor, N. Y., April 24 and 25. C. H. B. Chapin, Grand Central Terminal, New York.

Rocky Mountain Division, N.E.L.A.—Conference, Denver, April 24 and 25. O. A. Weller, Public Service Co. of Colorado, Denver.

Missouri Association of Public Utilities—Springfield, Mo., May 1-3. F. D. Beardslee, 315 North Twelfth St., St. Louis.

Southwestern Division, N.E.L.A.—Hot Springs, Ark., May 6-9. S. J. Ballinger, San Antonio Public Service Co., San Antonio, Tex.

American Institute of Electrical Engineers—District meeting, Springfield, Mass., May 7-10; summer convention, Toronto, June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

National Electrical Manufacturers' Association—The Homestead, Hot Springs, Va., May 18-23. E. H. Hubert, 420 Lexington Avenue, New York.

East Central Division, N.E.L.A.—Hotel Statler, Cleveland, May 20-23. D. L. Gaskill, Greenville, Ohio.

National Electrical Wholesalers' Association—Hot Springs, Va., May 26-30. E. Donald Tolles, 165 Broadway, New York.

American Electrochemical Society—St. Louis, May 29-31. C. G. Fink, Columbia University, New York.

North Central Division, N.E.L.A.—Managerial Section, Alex. Johnson Hotel, Rapid City, S. D., June 11-12. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

Canadian Electrical Association—Manor Richelieu, Murray Bay, Que., June 11-13. H. M. Lyster, 405 Power Bldg., Montreal.

Pacific Coast Division, N.E.L.A.—San Francisco, June 16-20. S. H. Taylor, 447 Sutter St., San Francisco.

National Electric Light Association—San Francisco, June 16-20. A. J. Marshall, 420 Lexington Avenue, New York.

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Nebraska Court Again Overrules Rural Law

THE Nebraska Supreme Court has declared invalid a thirty-thousand-dollar bond issue made by a farmers' electric district in Saunders County, holding that the law authorizing the formation of such districts was clearly unconstitutional in that it sought to confer legislative and judicial functions, as well as the right to tax, upon private corporations.

This is the fourth time that the court has invalidated this issue. After each former decision the Legislature passed an amended law which sought to cure the defects of the former. Now the court tartly says that while the Legislature may legalize unauthorized acts which could have been authorized in the first place, it is without power to legalize a defective proceeding based on a former act which has been held to be unconstitutional. The court suggests that instead of asking the courts to enforce what is held to be a moral obligation, the farmers organize under the general incorporation laws and do not seek powers of government.

The decision is regarded as of especial importance in view of the announced program of the public ownership leagues in the state to submit a similar law to popular vote in November. A permanent organization was effected by 75 persons, largely members of the Nebraska League of Municipalities, who met at Lincoln to take preliminary steps to have submitted, through the initiative, a bill embodying the various bills that the Legislature refused to sanction with respect to the electric industry. Attorney-General Sorensen, who heads the organization, presented a proposed bill. As an afterthought the executive committee was authorized to make choice between submitting the proposal to the electors or urging it upon the next session of the Legislature. One main purpose is legislation that will permit a statewide hook-up of municipal plants.

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Utility Matters Will Figure in Oregon Primary

WHEN Oregon's primary election takes place next month the electorate will be asked to nominate for Governor of the state one of two prominent men who unequivocally advocate state ownership and operation of hydro-electric utilities and the abolition of the Public Service Commission. In addition, the Oregon State Grange, as previously reported, is circulating an initiative petition for an amendment to the constitution which provides for the establishment and operation of electric utilities in designated water districts comprising one or more counties or municipalities. There is also being circulated throughout the state an initiative petition providing for the repeal of the law which created the commission.

On the other side are two candidates for Governor who do not believe in public ownership of utilities or any private industry now operating in the state. The citizens in 1926 voted 147,092 to 35,313 against a proposal to involve the state in the power business.

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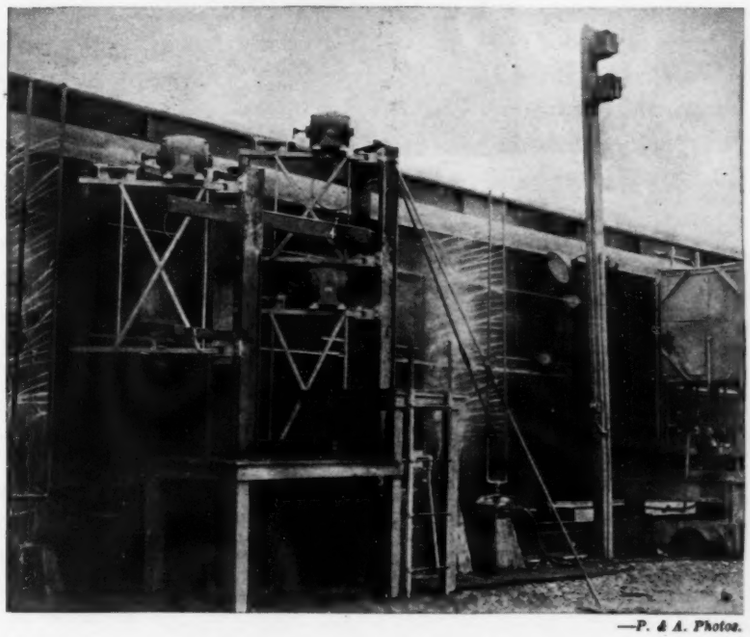
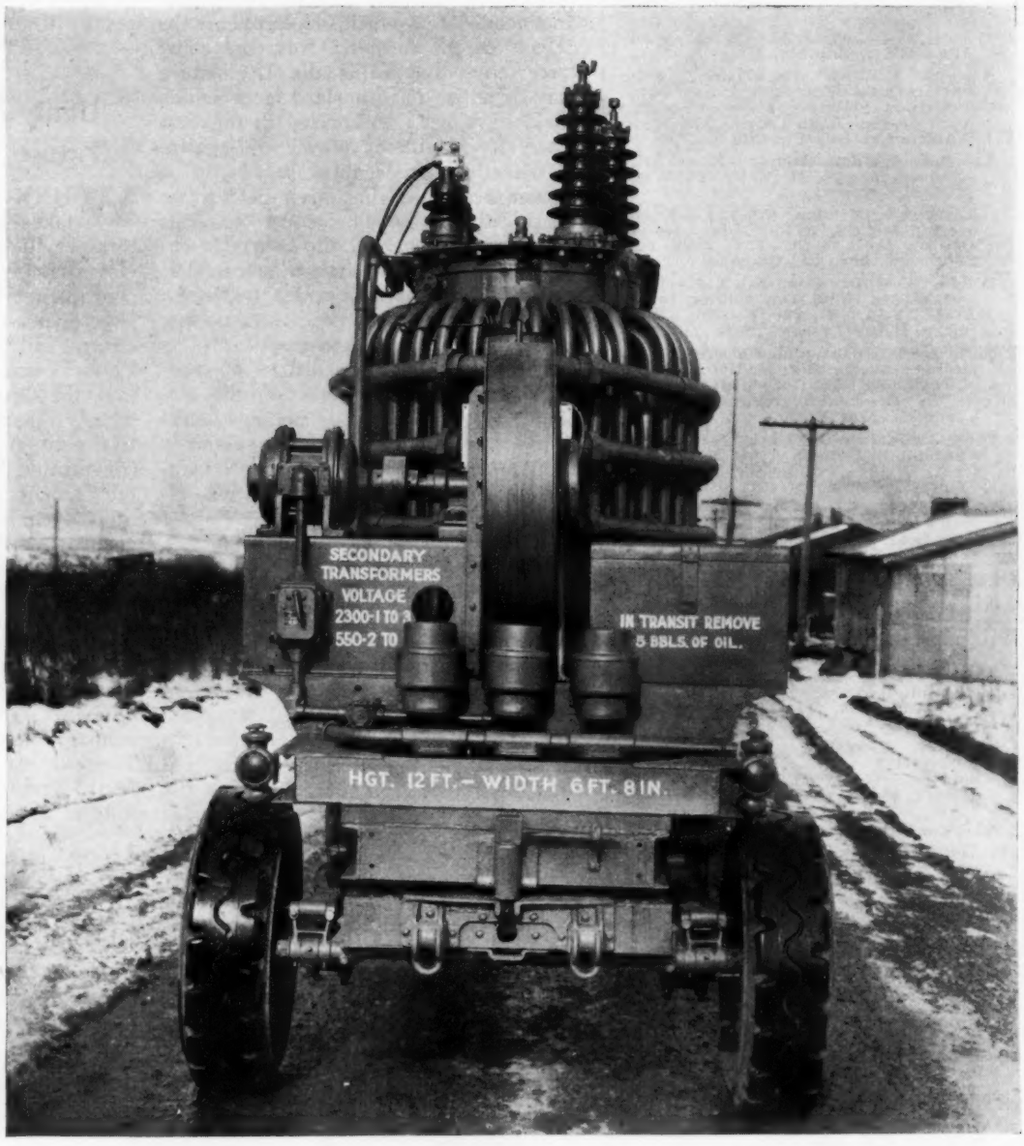
ELECTRICITY SPEEDS UP CAR BATHING



—P. & A. Photos.

Passenger cars on the Baltimore & Ohio Railroad are now scrubbed by vertical rotating brushes operated by motors in a fraction of the time it formally took to rub them by hand. The process is said to be a new one.



CAPITALIZING ON GOOD ROADS

NORTH CAROLINA has a splendid system of roads and the Duke Power Company uses this asset to give better service by building portable transformer substations mounted on trailers. When an industrial customer loses service through lightning troubles, transformer failure or other causes, these portable trailers are sent to give emergency service.

The truck illustrated carries a 1,500-kva., three-phase transformer with 44-kv., 2,300-volt and 550-volt windings. Without air blast the normal rating is 750 kva. Either end of the trailer may be attached to a truck and both front and rear wheels can be turned to permit access to any position. By removing the transformer oil while in transit some leeway in road loading is afforded. Three of these substations have been built and have proved very satisfactory in service.

EDITORIALS

L.W.W. MORROW
Editor

Utopia's Regulation Surpasses Ours

SIR THOMAS MORE'S island of Utopia has had ever since his disclosure of its existence in the early sixteenth century an impeccable system of governmental, political and legal machinery. No constitutional conventions, senatorial investigations or revisory commissions ever disturb the tranquil complacency of that perfected social entity. Even the provincial regulation of the utilities, incorporated in Utopia principally because less perfect organisms seem to think it an indispensable adjunct of government, is so unobstrusively administered as to escape notice.

But one who has sojourned there intellectually may be trusted to explain the nicety and temper of the regulatory concepts that prevail. It will be admitted that at the outset some difficulty was encountered in conversing with the authorities because their language seems to contain no words or ideas comparable to our "rate base" and "fair return." Much to the interviewer's amazement, valuations are an unknown practice and there is little concern about uniform systems of accounting and restrictions upon financing. Consolidations and mergers create no suspicion because they became the order of the day in the Utopian economic system long before we ceased worrying about their minor detrimental possibilities.

Utopia has not lagged in its technical progress, and the electric rates have steadily declined as the costs of production have been decreased. The companies find that they have to compete in the money market for the investor's dollar and in the commodity market for the consumer's dollar. Rates are, therefore, nearly at common levels for each class of use, with differentials attributable to departures in physical equipment and character of load. A few rate complaints have been filed by dyspeptic and constitutionally recalcitrant inhabitants. These are handled expeditiously by a nonjudicial body intent only on an economic analysis.

It seems that this commission's procedure is to ignore very largely the property values, capitalization, surplus and dividends and base its Solomonic rulings almost entirely on comparative data. The value of the service to the user on a competitive basis, reward to the utility management for enterprise and economies, credit for general industrial and social upbuilding of the entire community loom large as determining factors in the decisions. In fact, the dominant factor seems to be realization by the companies that the best service at the lowest price will bring the greatest over-all benefits to every one, investor, consumer and public. The commission's job is completed to the satisfaction of all when it applies moral suasion to any operating agency prone to worship discarded concepts of good business. Our legislators, commissioners and utility directors will do well to stop off at Utopia on their next Mediterranean cruise.

The Power of Co-operation

THE United States has crossed the valley of the worst industrial depression that has occurred since 1921 and is climbing the foothills of prosperity. That economic derangement did not bring disaster and that it did not continue for a longer period is very largely due to the alert, competent and resourceful action of President Hoover. He tried an experiment in co-operation that brought results.

After the stock crash many people were in a

mood to become panic-stricken and industrial leaders became cautious. Instead of going ahead with expansion programs, industry was inclined to scale operations to less than normal values. Here President Hoover stepped into the situation. He called leaders of industry together and successfully appealed to them to unite to minimize the effects of the industrial depression—its severity and its duration. As a result government and large unit groups in industry speeded up their construction programs, held wages steady and kept unemployment to a minimum. The light and power companies co-operated whole-heartedly with the President and spent $300,000,000 for new construction during the first quarter of this year—a sum far above normal. Other industries did the same thing, and the result was that the depression was both less severe and shorter in duration than would otherwise have been the case. While business is not inflated as in 1929—thank goodness!—it is in a healthy condition and is improving. The experiment of President Hoover was successful, and he deserves the thanks of every citizen.

Outdoor Rectifiers—Why Not?

ONLY a little more than a year ago the ELECTRICAL WORLD pointed out the necessity of American manufacturers entering the rectifier field with more vigor than they had done in the past. And now, before the last meeting of the transportation group of the New York Section of the A.I.E.E., a very important electrification—that of the Lackawanna Railroad in New Jersey—was cited in which American-built rectifiers are used. Some of the units are rated at 3,000 kw., thus constituting an installation which marks a new chapter in the history of American railroad electrification.

The rectifier substations and the accessory installations look neat, modern and well designed, and the data given on efficiency and other performance characteristics offer such self-evident advantages that discussion about the feasibility of rectifiers for railroad work seems to be definitely over. It was even suggested that in the future rectifiers may be placed outdoors, as are transformers. Why not? If any answers to the arguments which may be brought forth against this idea are needed, it is only necessary to look up the literature of a few years ago and read the arguments then brought forth against outdoor transformers and the replies thereto.

Truly, the Lackawanna electrification represents an extremely modern and obviously successful engineering achievement, alongside of which some other electrifications give an impression suggesting pages from an old catalog.

Melting Alloy Steel

ELECTRIC melting is becoming more important almost day by day in the production of alloy steel castings. In some quarters the impression has rather deeply sunk in that the ferrous-metal foundry is on the declining side of the wave owing to the increasingly greater use of welded structures and forgings in fields where the casting has for years held undisputed sway. It is true enough that the casting is meeting strong competition from these newer developments, but to conclude that the foundry is approaching the end of its day in industrial history is very far from the truth. As a matter of fact, as metallurgical research goes deeper into the mysteries of crystalline structure the art of casting appears to gain greater strength and security. The reason is that the ferrous alloys, of which so many have been and are being developed for specific purposes, cannot be welded and not all of them can be forged. They must be cast.

Electricity comes into the picture, not, as many people suppose, solely because it gives a better chemical control over the admixture of alloys to iron, but for a simpler though no less cogent reason. This reason is simply that the electric furnace is a more flexible and more easily operated mechanical device than an open-hearth furnace or a converter. For instance, the electric furnace may be tilted and the metal poured from below the slag and without disturbing it. Moreover, the electric furnace can be made in a smaller unit and it is comparatively easy for a foundry to change over from one kind of alloy to another.

Thus it is extremely probable that we shall see

an accelerated growth in the use of electricity for steel melting in foundries. This growth will come about, not because the foundrymen are particularly enamored of the electric furnace, but on account of the fact that as their products become more specialized and the unit quantities are decreased they will be forced to the use of that medium for melting which gives them the utmost in flexibility of operation and ease of control, both mechanical and chemical.

Arc-Welded Buildings Not Circus Stunts

BUT a few weeks past wistful smiles, with a metaphorical tear or two, were brought to the faces of New York electrical engineers by the noble gesture of two business men. "We apologize," said the business men in effect, "for fear that the riveting of structural steel by the indefatigable artisans engaged in the erection of our new buildings may in the weeks to come possibly, or probably, annoy our neighbors." A billboard, a sheaf of letters, bore the sad news to the community. *Mais quel geste!*

Electric arc welding has been applied to all too few new structures. Conservatism, lack of trained workers, discord over suitable or best structural assemblies, and, above all, failure by many municipal inspection boards to recognize welding as an adequate tool, have all delayed deplorably the age of quieter steel erection.

The recent announcement that two coming office buildings for power companies, one thirteen, the other fourteen stories high, are both to be of electrically arc-welded construction is an encouraging interlude; but here again, in the case of one, the old fear appears to return, for the lower four floors are to be a combination of arc-welded and riveted fabrication. An electrical manufacturer is starting work in an Eastern city upon what, it is anticipated, will be ultimately the largest building there. It will, if all goes well, be arc-welded.

The riveters' racket may be unknown tomorrow, and apologies unnecessary, but the leaders of the electrical industry can assuredly speed the day by adopting arc-welding for their new structures, pointing the way for others to follow. Why not, for example, weld substation steelwork?

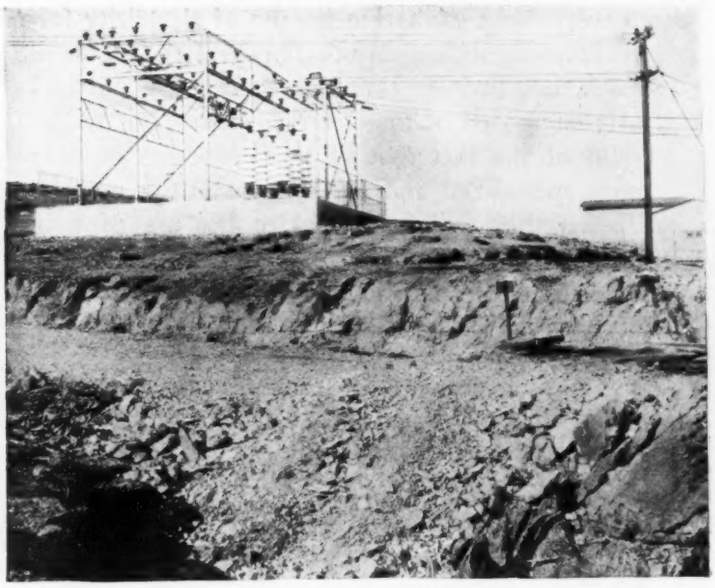
Congratulations to Hartford

EIGHT weeks ago last Tuesday the 20,000-kw. mercury boiler and turbine unit resumed operation at the South Meadow station of the Hartford Electric Light Company, following the completion of improvements found to be essential during the use of this outfit in preliminary service in 1929. Since this equipment went on the line under the new status it has generated in steam and mercury-turbo-generator energy more than 15,000,000 kilowatt-hours, and since the first of last month it has been operating at full load.

In smoothness of operation, ease of control and flexibility this power-generating unit compares favorably with the conventional equipment used in the steam cycle, and it requires no additional operating attendance other than customary practice. In economy the unit is closely approximating the design conditions for the mercury cycle, and South Meadow as a whole, producing electricity on one pound of coal per net kilowatt-hour, has taken its place in the front rank of modern efficient fuel-burning stations. It is noteworthy that some of the best days' runs of this plant have been realized on lighter loads, owing to the influence of the mercury unit under such conditions.

Two thorough examinations of the equipment have been made since regular operation was resumed, and everything was found to be in excellent condition. It is planned to conduct official tests of the unit in the near future, and when these are completed the results will be of great engineering interest. It is no secret that this courageous and interesting development, like many other major advances, has been accompanied by troubles of various kinds which have had to be eliminated and which received undue adverse outside comment in proportion to their influence upon the success of the mercury-vapor process.

The persistent and determined faith in the outcome of the development on the part of the engineers of the General Electric Company and the executives of the Hartford company bids fair to contribute a new and brilliant chapter to the history of electric power generation. The sole hurdle to be surmounted now is the test of time upon the reliability of the mechanical construction. There is every reason to believe that the best hopes of those responsible for this epochal development will be realized during the current year.



Hydro Efficiency Increased 10 per Cent

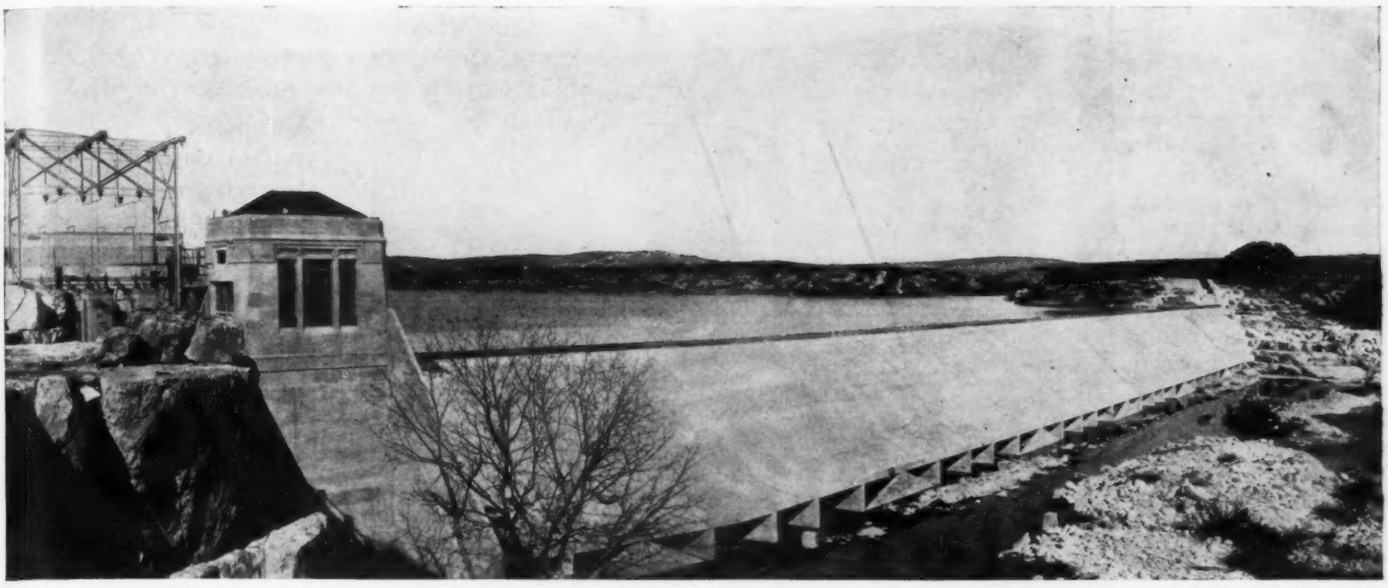
By C. L. DOWELL

Construction Engineer
Central Power & Light Company,
San Antonio, Tex.

SUBJECTED to a severe test of its ability to perform efficiently and continuously, the first Kaplan automatic adjustable blade waterwheel to be installed in America has successfully completed more than nine months' service at the Lake Walk plant of the Central Power & Light Company. The flow of the Devil's River during the last six months of 1929 was extremely low, and while another hydro plant at Devil's Lake, further upstream on the same river, was operated twelve to fifteen hours daily at a load giving the most efficient production, the 1,900-hp. Kaplan unit at Lake Walk was operated continuously. Since it is automatic, the day-to-day output has not been available for comparison except in a few cases for test, but taking the averages the output of the Lake Walk plant has been 10 to 12 per cent greater than if a stationary blade runner had been installed and operated under like conditions with a third to half load at times when the Devil's Lake plant was shut down.

Blade-moving mechanism of 1,900-hp. Kaplan turbine

The lake created at Lake Walk extends upstream some 4½ miles to the tailwater of the Devil's Lake plant, which



was the first project in the development. The reservoir has an area of 300 acres with a storage capacity of 5,400 acre-feet.

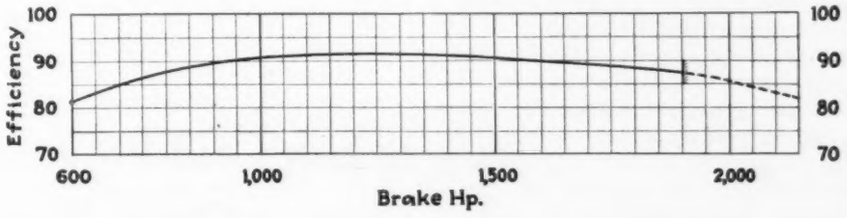
The dam is 34 ft. high from the river bed and has a total length, including the power house and non-overflow section, of 650 ft. Eighteen inches of wooden flashboards have been placed on the crest to utilize full head available back to Devil's Lake plant.

The Devil's River, with a drainage of 4,000 square miles, is for the most part a spring-fed stream, increasing in flow as it nears the mouth, and varies from 250 to 550 sec.ft., according to the rainfall of the previous season. However, during flood stage the flow has been as great as 180,000 sec.ft. For a one-unit plant this variable flow made the selection of the hydraulic equipment the major problem, particularly at this location, since the stream below the dam had to be flowing at all times to satisfy land owners for watering stock and to form natural property boundaries. A more important reason for continuous flow has now developed with the construction of the Devil's River station of 15,000 kw. initial and 45,000 kw. ultimate capacity, since this plant will use the water for condensing purposes.

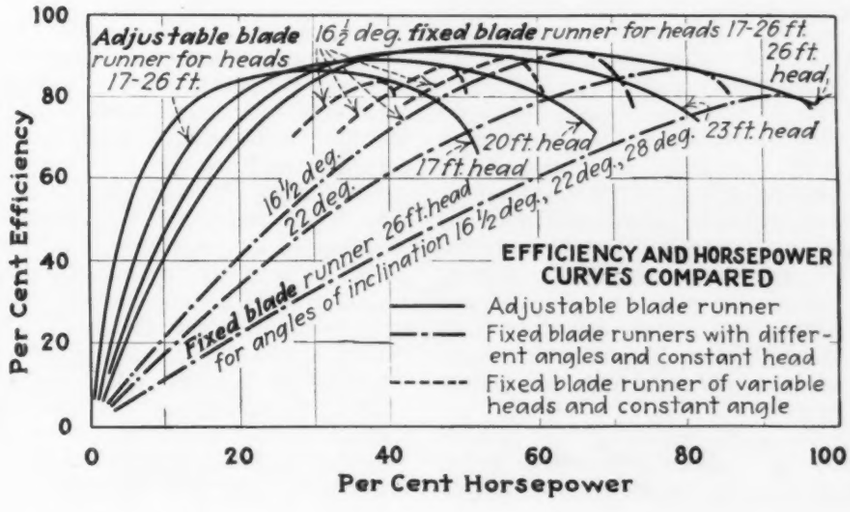
The S. Morgan Smith Company was able to offer a Kaplan turbine of Smith-Voith design which carried all the experience of the European manufacturer. This automatic adjustable blade turbine is now successfully in use in Europe at heads up to 58 ft. The manufacturers agreed to have an engineer from the foreign company supervise the work at the factory. This removed the experimental phase which usually accompanies a new design with such radical changes.

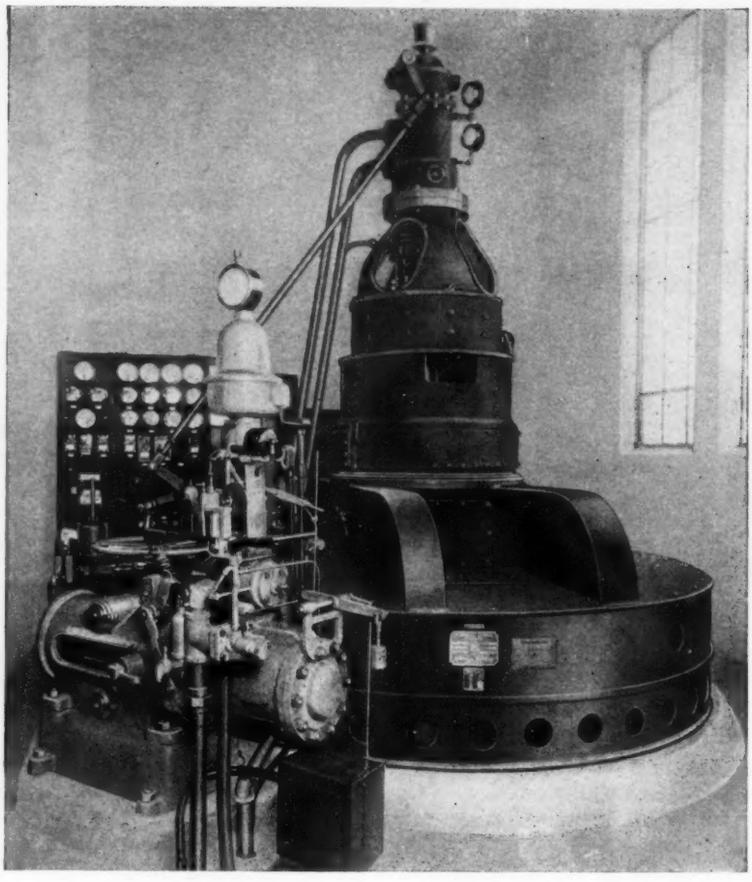
The operating

Performance curve based on 33 ft. net head and 277 r.p.m.



Fixed-blade and adjustable-blade performances





Automatic control obtained through governor and servo motor

principle is to have the angle of the blades vary with the gate opening, resulting in high efficiency at all loads. The main turbine shaft is bored out for a smaller shaft or regulating rod which rotates with it and also has a vertical motion of about 5 in. The lower end of this rod connects to a bottom plate below the hub, which is enlarged to take care of the moving parts. Connections to the blades are made by lever arms from four points on this plate, causing each blade angle to change as the shaft is moved up or down. Two pipes connect the servo motor, through the hollow generator shaft, to the stationary oil supply head mounted on top of the exciter. One of these pipes connects to the under side and the other to the upper side of the piston in the servo motor. Pressure in these pipes causes the regulating rod to move up or down, rotating the blades. The oil pressure system of the governor places the servo motor of the regulating rod in synchronism with the servo motor which controls the gate opening. In this way the angle of the blades varies with each change of the gate opening, giving the correct position for the highest efficiency for the varying volume of water available.

Another feature of the plant is the automatic control through a system of relays. The unit will stop and start when any one of several events takes place, such as low water, overload, overvoltage, undervoltage or heating of bearings. When the unit closes down it places in operation the two motors which operate an 18-in. gate valve in the bottom of the dam and a sluice gate on the crest, which together pass enough water to make the flow continuous. These valves are again closed when the unit starts up. The motors are energized direct from the high line, due to their size, rather than from storage batteries.

Inspection of the plant is made by the operators from Devil's Lake plant. Three 500-kva. transformers change the generated voltage from 2,400 to 66,000 and connect to the transmission system.

Since the Devil's River hydro plants are tied in with a 66,000-volt transmission system with other major stations and interconnections, and their irregular output does not affect the system, they are operated to utilize all the water available. A 1,500-kva., 2,300-volt Westinghouse generator with direct-connected exciter and type HR Woodward governor, which controls both the runner blades and turbine gates, are used with this turbine, the general arrangement of which is shown above.

▼ ▼ ▼

British Grid Progressing Despite Opposition

THE English grid scheme for the comprehensive generation and interconnection of the electrical supply of the entire island is progressing in spite of opposition from three quarters, declares A. B. Dibner, vice-president Burndy Engineering Company, who just recently returned from Europe.

The loudest objection comes from the landed squires, who dislike seeing the very beautiful English countryside marred by gaunt steel structures. They are upheld by the farmers, who have an antipathy for anything that might, even in a remote way, conflict with their ancestral freedom from interference. Surprisingly, the chorus is joined by some people in the aviation industry who fear the hazards of high-tension wires.

The grid authorities, however, have too important a mission to take much heed of any opposition, because England is finding herself rather backward in electrical development and is at the same time faced with an un-

employment problem for which electrical construction would be a relief. This system is intended to replace some twoscore suppliers of electrical energy in London. The enormous variations in voltage, frequency and rates will be replaced by a common organization, the benefit from which will be participated in by each component organization. The entire grid scheme is in the hands of a Parliamentary commission.

▼ ▼ ▼

Cutting Cost of Taps

How the expensive equipment usually required for connecting transformers to buses or lines can be avoided

By A. C. FINNEY
General Electric Company, Schenectady, N. Y.

EQUIPMENT is frequently required for the control of transformers that are small compared with the system to which they connect. One such condition commonly to be met is the case of an auxiliary power transformer fed from the main generator buses in a central station. A widely different condition involving similar difficulties is a small power tap on a high-voltage transmission line, as for a rural substation or small town supply.

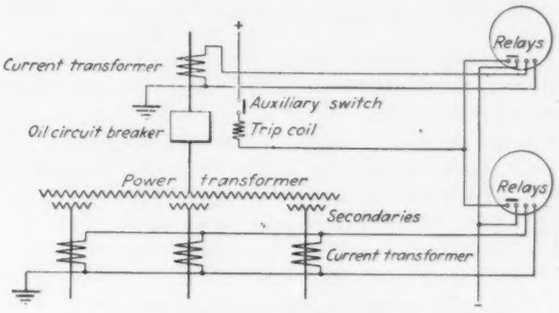
Close protection and accurate metering of such small circuits, with the usual equipment connected in the primary, in many cases involves equipment the expense of which is out of all proportion to the importance of the circuit. It may even require special designs beyond anything so far developed. Analysis of this situation indicates that, excluding transformer losses, metering may be just as well accomplished on the low-voltage side.

Protection of the circuit for excessive loads of any considerable duration requires the use of current transformers of capacity fairly close to the normal rating of the circuit, especially if thermal relays are used. Full protection for such conditions will be given by connecting relays or trip coils of the oil circuit breaker to current transformers on the low side of the power transformer, usually using the same current transformers as for metering.

Internal faults in the transformer or connections, of the nature of short circuits, will result in a flow of current in the primary connections only limited by the generating capacity and reactance of the system. Protective equipment must quickly open the primary oil circuit breaker. As a rule the current flow will be much more than sufficient to operate relays at minimum time through current transformers of several times the normal rating of the circuit.

A current transformer of a particular type or design will stand excessive currents for a short time almost proportional to the normal rating of the transformer. It is, therefore, commonly found that a 200-amp. or 300-amp. current transformer of a comparatively inexpensive type will stand the short-circuit current expected and will give adequate secondary current for short-circuit protection, when a 10-amp. or 15-amp. current transformer of the same type could not be safely used.

A small power transformer on a heavy capacity bus is therefore well equipped if provided with a primary oil circuit breaker tripped from one set of relays and current

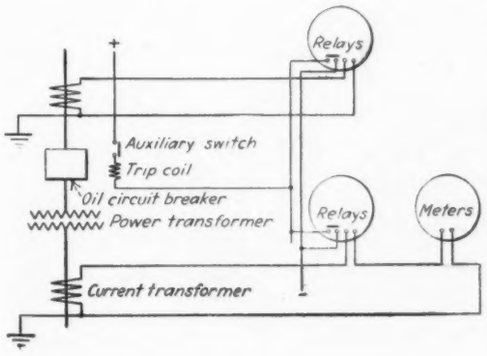


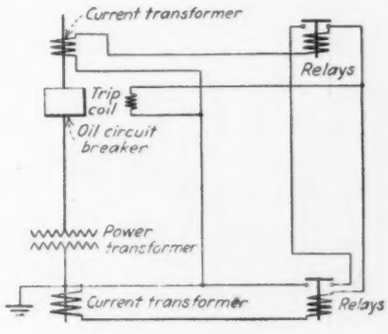
Protection for transformers with several secondaries

transformers on the primary and tripped from another set of relays and current transformers in the low-voltage circuit, metering also being accomplished from the low-voltage current transformers.

The other condition suggesting similar treatment is the case of a transformer connected to a high-voltage line, the transformer being small enough to draw primary current below the good working range of ordinary bushing current transformers. In many such cases it is desired to meter the circuit at the primary voltage. The most accurate, but also the most expensive, method is to use instrument type current and potential transformers on the high-voltage side. These same current transformers may then be used for operating protective relays.

A less expensive but still sufficiently accurate equip-





D.c. trip with circuit-closing relays and a.c. trip with circuit-opening relays

ment makes use of what are known as "two-stage" bushing current transformers, the second stage in the secondary operating on a compensating winding in the watt-hour meter to correct for ratio and phase angle errors. This will give fair accuracy with primary currents even as low as 10 or 15 amp. Protective relays of low burden may also be operated from the first stage secondary of the bushing current transformers. High-voltage potential transformers are still used for best metering accuracy.

The use of low-voltage potential transformers results in a compromise involving the ratio of the power transformer and variations in phase angle erors with changes in load and power factor of the circuit. With any connection of taps for a certain power transformer ratio and for definite conditions of load and power factor the complete equipment may be calibrated, but this in itself involves considerable expense and must be repeated with each reconnection of taps or change in the character of the load.

Low-tension metering simpler

If the situation will permit metering on the low side of the transformer the equipment may be much simplified. Current transformers in the low-voltage circuit may be of a size suited to its rated load, resulting in accurate metering and allowing the use of relays set to give close protection against continued overload. Short-circuit protection for the complete equipment may then be accomplished by using bushing current transformers of ordinary type on the high-voltage side to operate another set of relays as in the accompanying illustration. These will operate to trip the breaker on short circuit or internal trouble in the power transformer. A bushing current transformer of 150 amp. capacity or above will in most cases be well below the system short-circuit current available and should give more positive operation of protective relays than unnecessarily small sizes.

Occasionally the conditions are complicated by several secondary windings, possible at different voltages, in the power transformer. In such cases it is only necessary to use current transformers of proper capacity on each low-voltage winding connecting the current transformer secondaries in multiple for operating the relays as indicated in the accompanying illustration. This relay will be set for the total capacity of the power transformer. Protection on the high side will be included as before. Metering of each low-voltage winding separately will usually be most satisfactory in this case.

The foregoing suggestions are offered as a means of keeping the expense of equipment for the control of small transformer circuits within bounds consistent with the size of the transformer.

350,000-Kw. Line Costs $55,000 per Mile

THE New England Power Association's 220-kv. line between Fifteen-Mile Falls and Tewksbury, Mass., includes a section in Massachusetts about 6.5 miles long, and the estimated cost of this short section as separately prepared by the engineering department for submission to the Massachusetts Department of Public Utilities totals $360,000 and covers a right of way 350 ft. wide, two single-circuit steel tower power structures and a telephone line on wooden poles, as shown in the accompanying cross-section. Space for a third steel tower circuit is provided in the center of the right-of-way and there is room for a second telephone line. Major details of this line follow:

Power Structures.—Two parallel lines of galvanized steel towers with cross-arms 47 ft. long and bottom chord 55 ft. above ground.

Power Insulators.—Standard strength ball and socket type disks in strings of fifteen at suspension locations. The center conductor will be restrained from transverse movement by use of two strings of disks in a V-shaped bridle hitch. Heavy-duty high-strength disks in strings of seventeen will be used at dead-end locations. Each string, including those used in the bridle, will be assembled with arcing and grading shields.

Power Conductors.—Two three-phase circuits of 795,000-circ. mil. 61-strand, bare aluminum cable, steel reinforced, ultimate strength about 28,000 lb., sagged to give a tension of 6,000 lb. when loaded with ½ in. of ice and 8 lb. wind at 0 deg. F. Carrying capacity, 175,000 kw. per circuit as designed.

Ground Wire.—Two per tower line, ½ in. diameter, extra heavy galvanized seven-strand steel cable, with ultimate strength of about 27,000 lb., carried on tower between and 4 ft. above conductor supports. Sagged to give a tension of 6,000 lb. under loading and wind conditions specified for power conductors.

Tower Spacing.—About nine structures per mile of single circuit.

Minimum Clearances.—Above ground, 27 ft.; above highways, 32 ft.; above foreign lines, 14 ft.

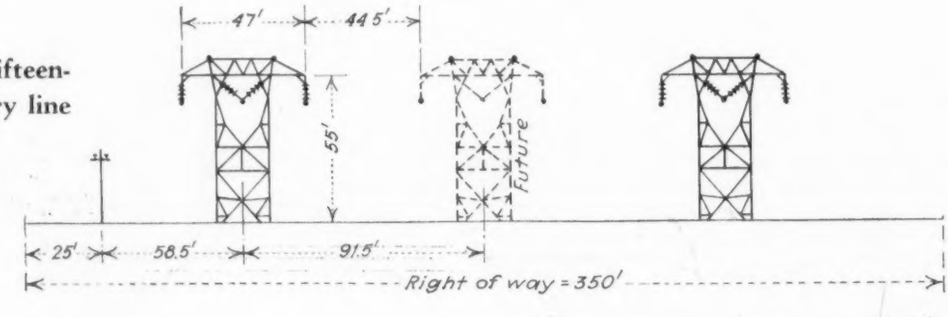
Telephone Line.—Two No. 6 A.W.G. solid bare copper-clad or equivalent wires on a separate wooden pole line. Poles about 32 per mile.

Estimated Cost of Massachusetts Section of Fifteen-Mile Falls-Tewksbury Line

(Two 220-kv. Circuits)

Rights-of-way and lands	$90,000
Clearing rights-of-way	26,750
Steel towers in place	90,000
Power wire	69,000
Insulators	31,900
Ground wire in place	10,750
Special work	2,520
Telephone line complete	8,850
Camp equipment and tools	2,830
Superintendence, payroll insurance, surveys, etc.	27,400
Total 6.5 miles line	$360,000

Cross-section of Fifteen-Mile Falls-Tewksbury line



What Kind of Street Lighting?

IS A SERIES system better than a multiple system for supplying street lighting? Many factors determine the answer, including style effects, lighting requirements, control precision, circuit operation and relative costs.

THE AUTHOR of this paper discusses the systems and outlines a basis for making an economic comparison of the two systems. This method, with data pertaining to a particular situation, should help engineers reach a decision.

By M. S. GILBERT

Illuminating Engineering Department, Westinghouse Electric & Manufacturing Company

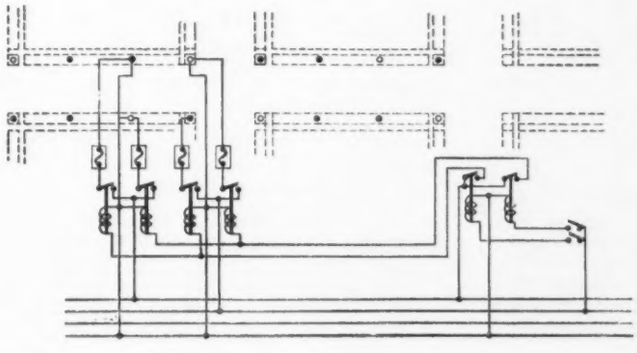
AT FREQUENT intervals those concerned with problems of street lighting are confronted with the question as to whether or not a series system would be a better means for supplying energy to the lamps than a multiple system. Such a question is a difficult one to decide, inasmuch as so many of the factors to consider do not have any particular significance in every case.

For instance, the street-lighting load might constitute such a large portion of the total load placed on the distribution system that if all the lamps were turned on simultaneously the starting current of fourteen to twenty times the normal load current might seriously interfere with the regulation of the distribution circuits. Perhaps it might be more desirable to take advantage of underground distribution mains already installed and use a multiple system than to go to the expense of installing an entirely new series system. Or, possibly, it might be necessary to install and operate only a few additional lights each month in order to spread the cost through several months' budgets and thus avoid a large initial expenditure where funds are limited. In a case such as the latter, which is not frequently encountered, it stands to reason that the multiple system is the only one to consider. There are so many points of a purely local nature to take under advisement that in a discussion of this kind one can only point out the various considerations involved and let the reader be guided by those that have a bearing on his particular problem.

It is generally accepted that series systems are simpler to design and control, while the design of a multiple street-lighting system of any appreciable size will require a considerable amount of time and ingenuity on the part of the engineer in order to obtain the best arrangement of circuits and provide for their control. Furthermore, if it is desired to operate part of the lights only until around midnight and the balance until dawn, more complications and problems of control are introduced. Although the trend is toward full-time operation of all the units during darkness, there are a sufficient number of systems operating on a part-night and all-night schedule to warrant considering them. While this practice may survive for some time in towns and villages where night life and vehicular traffic are at a minimum, in many cases the saving in energy due to the part-night operation is less than the difference between fixed charges of the two schedules.

Control of series systems

Control of series systems is very easily effected by providing a switch for each circuit. As series systems usually have one circuit to a transformer, although in some cases there are two circuits per transformer, the closing of one switch will turn on all or possibly only



Typical multiple street lighting

Connections are made from an existing distribution system. Relays operate in a pilot circuit that is energized when lamps are not burning. This makes faults in pilot circuit readily visible.

half of the lights comprising the load of one transformer. Or, if a number of regulating transformers are required, as sometimes happens in a fair-sized city, the circuits may be "cascaded," i.e., the switch that closes the second circuit may be operated by a solenoid in series with the first lighting circuit, the switch that operates the third lighting circuit may be operated by a solenoid in series with the second circuit, and so on down the line. The first circuit is operated by a time switch or switch of any other convenient type. This method also has the advantage of a very brief interval between operations of successive switches, thus avoiding a total instantaneous load.

There are several good methods for controlling multiple circuits, but obviously they require more equipment than does the cascaded system for control of series circuits. These methods may also be used for controlling series circuits, although they are not as desirable as the method described above. One method employs pilot circuits to actuate small solenoid switches. These circuits may also be cascaded in the same manner as the series-lighting circuits. The other method, known as resonant control, employs the existing distribution system to carry a high-frequency current to tuned relays connecting the lights generally to the same conductors that carry the high-frequency impulse. Much more could be written on the subject of control, but for this discussion it is not necessary, as the author only aims to point out major considerations relative to the main topic.

Comparison of inherent characteristics of series and multiple circuits

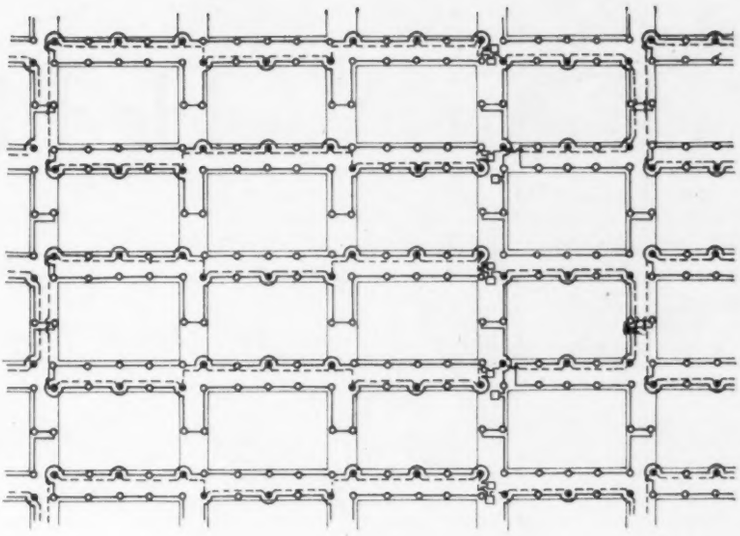
Another important item is the circuit proper. With a series system all that is necessary is a single conductor, running continuously from the regulating transformer to the first lighting unit, from the first lighting unit to the second, and so on around and back to the transformer, completing the circuit. Usually the conductor is a

COMPARISON OF ANNUAL STREET LIGHTING COSTS FOR 375 PART-NIGHT AND 125 ALL-NIGHT ORNAMENTAL STANDARDS

Lamp Performance Data:	**Multiple**	**Series**
1. Lamp rated size in watts	750.0	773.0
2. Lamp rating in lumens	14,775.0	15,000.0
3. Lamp amperes (rated)	6.5	20.0
4. Lamp volts (rated)	115.0	38.6
5. Lamp watts mean throughout average life	748.0	772.0
6. Mean lumens per watt in per cent of initial rated lumens	85.0	95.0
7. Mean lumens	12,559.0	14,250.0
8. Mean lumens per rated watt	16.7	18.4
9. Guaranteed average life in hours	1,000.0	1,350.0
10. Lamp replacement cost per lumen hour, cents	0.0144	0.0179
11. Cost per lumen year (4,000 hours), dollars	0.58	0.72
I—Investment per Lamp in Miscellaneous Circuits and Control Equipments (Excluding Main Distribution):		
A—Conductors from lamps to point of connection with underground cable	$2.70	$5.10
B—Remote switches, relays or other control equipment	12.20	4.80
C—Special circuits for control only	3.85	1.20
Total	$18.75	$11.10
II—Investment per Lamp in Main Distribution Cables, Their Accessories and the Lighting Units:		
A—Pro rata of primary distribution investment from generating plant to substations and pro rata of substations investment (exclusive of electrical apparatus)	$32.00	$35.50
B—Pro rata of secondary network investment to street lighting	33.70	Nil
C—Series distribution circuits	Nil	22.00
D—Constant-current-regulating transformers	Nil	24.00
E—Switchboards at substations	1.00	1.00
F—Ornamental standards complete with luminaires and foundation	125.00	125.00
Total	$191.70	$207.50
III—Fixed Charges on Investments:		
A—Interest at 8 per cent on Items I and II	$16.75	$17.50
B—Taxes and insurance at 4 per cent on Items I and II	8.38	8.75
C—Depreciation and obsolescence on Item I over ten years (factor 0.0724)	1.36	0.80
D—Depreciation and obsolescence on Item II over 15 years (factor 0.0398)	7.65	8.26
Total fixed charges	$34.14	$35.31
IV—Working Capital Charges:		
A—Breakage and other losses on standby stores	$0.45	$0.45
B—Interest on average standby stores inventory, plus insurance and warehousing	0.85	0.85
C—Interest on average accounts receivable	0.24	0.24
Total	$1.54	$1.54
V—Operating Costs:		
A—Energy cost for part-night lights (2,500 hours annual burning at 0.015 per kw.-hr.)	$28.05	$28.95
B—Energy cost for all-night lights (4,000 hours burning at 0.01 per kw.-hr.)	29.92	30.88
C—Average energy cost per unit per year*	$28.52	$29.43
D—Lamp replacement costs on part-night units based on list less 36 per cent (1,000 hours average life for multiple lamps, 1,350 hours average life for series lamps)	6.89	6.15
E—Lamp replacements on all-night units	9.60	8.53
F—Average lamp replacement cost per unit	7.57	6.75
G—Replacement of glassware, and fittings	2.80	2.95
H—Replacement of lighting standards (posts)	1.20	1.20
I—Patrolling (0.90), service calls (0.20), cleaning four times per year (1.60), photometric testing (1.20)	3.90	3.90
J—Repair and testing of underground cables	1.50	1.50
K—Management, office records, engineering and supervision	9.30	9.30
Total	$54.79	$55.03
VI—Summation:		
Fixed charges on investments, Item III	$34.14	$35.31
Working capital charges, Item IV	1.54	1.54
Operation cost, Item V	54.79	55.03
Total	$90.47	$91.88
Mean lamp lumens	12,559	14,250
Annual cost per lumen	$0.072	$0.0645

*The efficiency and secondary power factor of the constant-current-regulating transformers at average load are 95.5 per cent and 90 per cent, respectively, as against approximately 97 per cent and 95 per cent for average multiple operation. On the other hand the distribution losses for the multiple system under average operation are somewhat higher than for the series system. These considerations approximately offset each other except under abnormal conditions, and since in this comparison the author has used an assumed instead of a derived kilowatt-hour rate, a segregated calculation of these performance factors would only greatly complicate the matter and would influence the results less than if, for example, a 10 per cent error were made in computing the interest on the cable investment.

No. 8 B & S gage for 6.6-amp. underground circuits and No. 6 B & S gage for all other types, including 20-amp. underground circuits. Occasionally safety coils or autotransformers are used in connection with each lighting unit for the purpose of operating 20-amp. lamps on 6.6-amp. circuits, and in such cases two No. 10 wires are used to make the connection from the safety coil to the lamp socket. In designing series circuits it is only necessary to provide the one or more regulating transformers that may be required to take care of the total load, including the line losses, and insulate the conductor of each circuit for the open-circuit voltage of the regulating transformer. It does not matter how far apart the lighting units are spaced when it comes to deciding on the size of the conductor.



Typical series street lighting

Regulating transformers are connected to the primary line by means of switches actuated from pilot wires or from the preceding series circuit.

In the case of multiple circuits it is usually the custom to provide a three-wire grounded neutral system of distribution, which means that three times as many conductors are required as are necessary with series circuits. Of course, if the wires are already available for other loads the lamp sockets may be easily tapped on, provided that the available wires are large enough to accommodate the extra load without allowing too great a voltage drop across those sockets that are farthest away from the distribution transformer. If the lamps are spaced too far apart to keep the voltage drop to a minimum, or if other loads will contribute too much to the voltage drop, it may be possible to use larger-sized conductors or to install feeders to take care of the situation.

At any rate there are many more things to consider in designing the circuits for a multiple system than there are in the case of the series system.

Difficulty of maintaining constant potential

Another point to consider is the operation of series versus multiple lamps. The modern series lamp operates at a constant current, which is maintained by a constant-current-regulating transformer. If a lamp burns out the regulator immediately adjusts itself to its decreased load and the current remains constant, assuming that a protective device such as a film socket is provided to keep the circuit closed upon failure of a lamp, an assumption that may safely be made. On multiple circuits, however, it is not possible to maintain either constant current or constant potential, as the failure of a lamp will cause a rise in voltage across lamps farther away from the source of supply. It is accepted that the life of a lamp is greatest where the current has been constant over the entire period, which gives the series lamp an advantage. This advantage may be questioned, however, as the price of a series lamp is decidedly higher than that of a multiple lamp with approximately the same lumen output, and series sockets are higher priced than multiple sockets.

After considering the advantages of series and multiple systems one would think it possible to design a standard circuit of each type, estimate the fixed charges and operating costs of each and, with these as a basis, to derive formulas which, when applied to a given street-lighting problem, would help determine the type of distribution to use. In attempting such a derivation, however, many complications are encountered, rendering the work useless from a practical standpoint before the formulas could be obtained.

Although the derivation of formulas was impractical, a comparison was made of the costs of the two systems illustrated by accompanying figures. This comparison was made by C. J. Stahl in his recently published book, "Electric Street Lighting," and is herewith presented with his permission.

Little difference in costs of series and multiple lighting

The principal conclusion that may be drawn from the foregoing comparisons is that there is little difference between the costs of an average multiple and series street lighting installation as represented by the accompanying illustrations.

In computing the above table sufficient specific information was not always available. For example, in figuring Item II B it is quite difficult to tell just how the street-lighting peak overlaps the pre-existing peak or how much extra load capacity is required for the street lighting alone. As the peaks usually overlap, a certain prorating charge is in order.

In accordance with the statement made in a preceding paragraph, in deciding which system to use one must consider which will be most convenient and efficient for the particular problem. The accompanying table can be made useful as it presents an outline of various factors that should always be considered. However, there are other points, such as relative convenience and simplicity of design and operation, that can hardly be evaluated on a dollars and cents basis to be included in the table, but which nevertheless deserve consideration.

Arc-Welded Buildings

SINCE 1887, when the use of arc welding was demonstrated for joining rails in street car systems, arc welding has had wide application, particularly in shop fabrication and field repair of machines.

ONLY in the last decade has it been shown that welding may, and probably will, become a real factor in the erection of steel building structures. A significant milepost in this development was the recent announcement of the Austin Company, well-known construction and engineering firm, that it is now prepared to offer welding as an alternative to riveting in any type of building steel erection.

By FRANK P. McKIBBEN

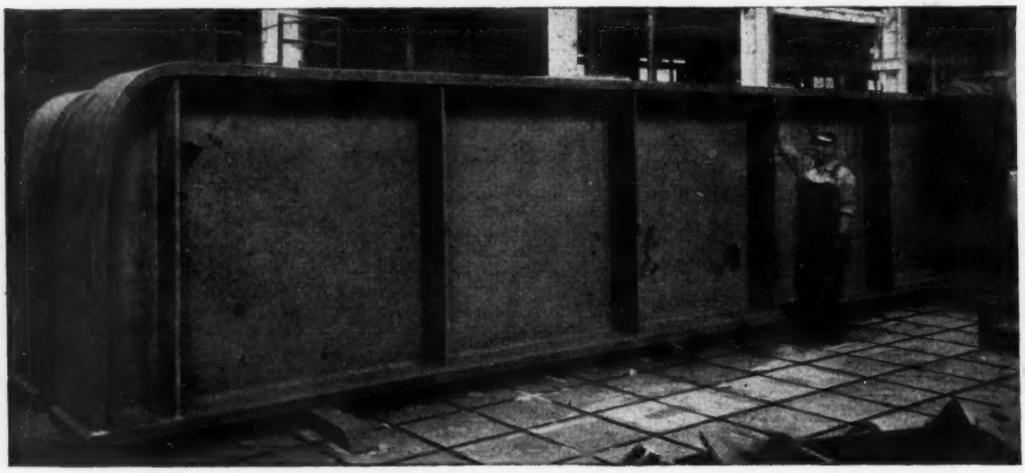
Black Gap, Pa.

THERE are in the United States nearly 100 buildings* in which welding has been totally or partly used. The tallest, the Hotel Homestead at Hot Springs, Va., welded by the American Bridge Company, is 180 ft. high with eleven stories in the main part of the building. The next tallest is the steam power plant of the Hotel Chalfonte, Atlantic City, N. J., 150 ft. high, carrying boilers and other equipment common to steam power plants. The General Electric Company's welded building at West Philadelphia contains the greatest tonnage of welded steel and in the 987 tons of steel there is not a single rivet. This building has several 10-ton traveling cranes, operating on spans of about 58 ft. 6 in. to 78 ft., and has many 2-ton wall cranes. The structure has been in use nearly two years and a recent thorough examination of all the welds showed them sound and safe. I know of no failure of any welded joint in any building thus far erected—a good record.

There are about twenty railroad and highway bridges which are partially or wholly welded. For example, the old Pennsylvania Railroad bridge over the Susquehanna River at Havre de Grace, Md., had an upper deck welded in to carry the heavy truck and northbound auto traffic, while the old railroad floor was made to carry the southbound highway traffic, thus making a double-decked structure. The upper deck is entirely welded throughout the whole length of the bridge, which is about 3,000 ft. The Pennsylvania Railroad welded some important eyebars on one of its railroad bridges near Pittsburgh in order to strengthen it and the Chicago Great Western Railroad welded several hundred tons of steel on its bridge over the Missouri River at Leavenworth.

A new building in Los Angeles 150 ft. high will have its earthquake bracing welded. Arc welding is very useful in attaching new I-beams to an old beam or column in an old building because only the brickwork in front of the old steel need be removed, whereas in

**Based on address before Louisiana Engineering Society.*



Welded girders for upper bearing bracket of 19,000-kva. hydro-generator

Permitted in 71 Towns

Went up in silence— no staccatos from riveting

other methods of connecting the brick in the rear as well as the front would have to be removed.

Seventy-one cities and towns have already adopted welding in their building codes, the largest city being Dallas, Tex., with 300,000 population. In New England the only cities which have taken formal action and have adopted ordinances permitting welding are Pittsfield and Lynn, Mass. These two have incorporated the American Welding Society's code† for welding steel building frames. This code is the best thus far written for its purpose. It includes requirements for strength of welds for use in design, for the qualifying or testing of welders, for the grade of welding wire to be used, etc. Although only two New England cities have adopted codes for welding, there are welded buildings in several other New England cities, built presumably under special permits or ordinances. New York, Baltimore and many other cities are now considering the adoption of welding.

In one city a permit to weld a hospital building was refused recently notwithstanding the fact that there were several hospital buildings located near the new addition. If ever there was a place where riveting should be avoided it is in the extension of hospital buildings.

The Bureau of Standards, the American Bridge Company, General Electric Company, many college laboratories and others have made hundreds of tests on welded joints in order to find out the strengths of welds to be used in design. As a result of all this, the American Welding Society recommended that, in shear, the weld metal (fillet) may be safely stressed to 11,300 lb. per square inch for buildings. For a fillet such as is used to connect a beam's web to the face of a column this 11,300 lb. per square inch means 3,000 lb. per linear inch for a triangular fillet of $\frac{3}{8}$ in. size. In plain English, a $\frac{3}{8}$-in. fillet 1 in. in length can carry 3,000 lb. safely, so if we have 30,000 lb. to be transmitted it would take 10 in. of $\frac{3}{8}$-in. fillet to do the work. Look at this another way. If a $\frac{3}{4}$-in. rivet is good for 4,500 lb. in single shear, it would require $1\frac{1}{2}$ in. of $\frac{3}{8}$-in. welded fillet to equal the rivet's strength; or if in double shear at 9,000 lb., then 3 in. of $\frac{3}{8}$-in. fillet is required.

Although most welding on buildings has been done by hand welding and for much of this work hand welding is by far the easiest and cheapest at present, there are shops which are fabricating steel with automatic welding machines operating with heavy currents and high speeds. One structural shop has such a machine which uses two electric arcs at the same time and can weld two seams at once on a column or on a plate girder flange. At Holyoke, Mass., the Walsh Boiler Works has an automatic arc welder for welding the longitudinal seams on steel pipes and this uses four arcs simultaneously under great speeds. One of the most noteworthy uses to which this machine has been applied is the Springfield, Mass., water pipe line, which is about 7 miles long, shop arc welded in 30-ft. lengths, and then riveted together in the field.

FOR welding buildings where $\frac{3}{8}$-in. fillets are used 175 to 200 amp. with an arc voltage of 18 to 20 gives satisfactory results for hand welding with 3/16-in. welding wire. This wire is of practically the same chemical composition as structural steel, with carbon content of from 0.0013 to 0.0018.

†*Can be obtained by writing author.*

In the West Philadelphia welded building of the General Electric Company the welded roof trusses, having spans of 59 ft. 6 in., weighed 5,000 lb., whereas riveted trusses carrying the same loads on the same spans weighed 6,800 lb., showing a saving of 1,800 lb. per truss for welding. Corresponding figures for 78-ft. spans were 9,200 lb. and 13,200 lb., a saving of 4,000 lb. for welding. A comparison between a riveted and a welded plate girder each of 40 ft. span and each carrying 4,000 lb. per foot over the entire span shows the riveted type to weigh 7,498 lb., whereas the welded type weighs 5,467 lb. In this case the welded girder saves 27.1 per cent of steel, or 2,031 lb.

The conservative building commissioner, engineer and architect will not rush headlong into using new and untried methods and materials, but he will not be so conservative as to lean backward and make no progress at all. The proper attitude toward welding should be that here is a method of joining steel that is noiseless. In many cases it saves much weight of steel; it is being more widely used for buildings and bridges every year, and has been permitted already by ordinance in 63 municipalities. Let us investigate and if found to be satisfactory and safe let's adopt it; if not, let's reject it. At all events, let's investigate.

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Assume Obligations to Electrical Workers

Electrical Contractors' Association of New York completes novel insurance agreement with Brotherhood of Electrical Workers

"INDUSTRY cannot and should not attempt to escape its responsibilities and obligations to aged and disabled workers and their dependents." With this in mind the Electrical Contractors' Association of New York has completed an insurance agreement of a rather novel nature with Local Union No. 3 of the International Brotherhood of Electrical Workers. "Many of our largest industrial concerns have already provided protection and benefit to their thousands of employees and their dependents. The public has commended them highly for doing so. Ordinary decency justifies this; in fact, demands it," says the insurance proposal.

The enormous turnover of labor in the electrical construction industry makes it essential that some specialized plan be adopted. The very nature of the industry requires the men to move from place to place and from industry to industry. One electrical contractor may today employ many more workers than he will need tomorrow. The usual form of group insurance provides that when a workman leaves his employer he leaves his insurance behind, but this would obviously be unsuitable to this particular industry, hence the specially devised scheme already referred to, which involves the following:

A board of insurance trustees is elected to administer a permanent fund to be established and maintained by employers in co-operation with Local Union No. 3, to provide group insurance, old age pensions, total disability, and other benefits for the members. The board itself does not pay life insurance disability or pension benefits, nor does it in any way engage in the insurance business.

The board shall consist of five men, four selected by the Electrical Contractors' Association of New York and one by Local Union No. 3. The board may increase its members from time to time and provide for the method of appointment and removal of such additional members.

Powers of board of trustees

The board of insurance trustees is given power to enter into an insurance contract with a reliable legal reserve insurance company for $3,000 group life insurance, $40 monthly pension for those of the age of 65 years or more and $30 monthly for those totally disabled, the monthly disability payments to be deducted from the amount payable at death.

Various other stipulations with regard to the board's duties are set down. They include the making of required statements, keeping of books and co-operating with the representatives of the employers and the union.

In order to provide the required funds each employer (beginning November 1, 1929) pays to the board of insurance trustees the sum of 20 cents per hour worked by each one in his employ in Greater New York and Long Island on a union card issued by Local Union No. 3.

These payments are made weekly and in accordance with the regulations governing payments adopted by the board from time to time. Uniform penalties may be imposed by the board for failure to make payments when due, or for any attempt to commit frauds. The intent is to create and to maintain from such payments at times a reserve fund large enough to pay one full year's premium to the insurance company. After this amount of reserve has been created and while maintained the board of insurance trustees shall proportionately reduce the amount to be paid by the employer.

The employer is not obliged to make any payments to the board of insurance trustees for employees engaged on work which was contracted for prior to November 1, 1929, but the employer agrees to furnish the board, or any one selected by it, with proof of such contract and a detailed list of such jobs they cover within five days after the signing of this agreement. This exception does not cover additional or extra work.

Should any employer cease employing union members, or should the union for any reason cease doing business with such employer and withdraw its members from his employ, then such employer shall nevertheless be obligated to pay to the board of insurance trustees the required payment on all work fully or partially completed up to that time, but not thereafter, and such employer in this event shall have no further interest or right in any insurance or benefit provided for or funds accumulated by the board of insurance trustees.

So that members of the Electrical Contractors' Association of New York will be placed at no competitive disadvantage with others—since this insurance and benefit arrangements improve the condition of the union members—the union agrees to make the adoption and enforcement of this agreement a condition of employment of its members by employers not belonging to the Electrical Contractors' Association of New York.

Buried Armored Cable Serves Industrial Plant

By A. B. APPLE

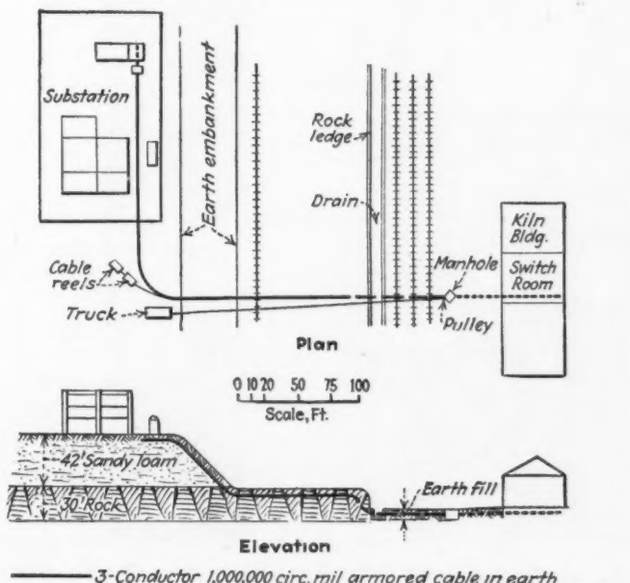
Underground Engineer Nebraska Power Company, Omaha, Neb.

INDUSTRIAL plants sometimes have certain local conditions which require special service arrangements to bring power to them. A striking case is that of the Ash Grove Lime & Portland Cement Company, whose plant spreads over the floor of an old quarry near the town of Louisville, Neb. The service, which is underground and 450 ft. long, passes over the lip of the quarry, then under railroad tracks and includes both lead-covered single-conductor cable in duct and three-conductor armored buried in the ground.

The service run, consisting of two 4,000-volt lines, begins in the power company's substation on a bluff just southeast of the cement plant and terminates in a switchroom in the kiln house at the foot of the bluff. From the substation down the bluff to a manhole located about 40 ft. from the switchroom two 1,000,000-circ.mil, three-conductor, varnish cambric - insulated, lead - covered, armored cables are run. These, with a nine-conductor control cable and a No. 4/0 bare grounding conductor, are laid in the ground, except for short concreted duct-inclosed sections under four railway tracks and across a large drain. In the manhole near the switchroom the armored cables are spliced to single-conductor, 1,000,000-circ.-mil., lead-covered cables, which are run in duct to the cable pit in the switchroom.

The installation of the armored cable was not as difficult as it would seem, since it was done mostly down hill. The cable reels were mounted tangent to the curve of the trench at the top of the bluff and the pulling line reeved through a pulley near the manhole at the foot of the bluff and back to the winch on a truck at the edge of the bluff. The cables were pulled singly. They were paid out along the trench up to the ducts at the top of the rock ledge, then the ducts were rodded and sufficient additional length taken to reach the manhole. The track at the base of the first declivity was broken and replaced after the cables were laid in the trench. The ducts under this track were split, placed around the cables and then concreted. After the cables had been pulled down the hill and across the quarry floor to the manhole sufficient lengths were unreeled and looped back and pulled into the trench to the manhole in the substation. No special provision was made to hold the cables from slipping down the hill, as the earth provided an efficient anchorage.

Cables were pulled down through an open cut in the face of the bluff



Armored cable brings electric service to quarry

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760,000 Hp. in Green River Basin

VAST quantities of potential power, numerous dam sites and the resources and industries of 45,000 square miles of territory are analyzed in a report on "The Green River and Its Utilization" just completed by Ralf R. Woolley, federal hydraulic engineer in charge of the Salt Lake office, which covers the 730 miles of the river proper flowing in Wyoming, Colorado and Utah and also the extensive tributaries.

According to the report, the potential power of the basin totals 759,600 hp., while today there is less than 2,000 hp. developed. Thirty-one of the sites are in Utah and are capable of producing a total of 547,000 hp., 479,000 hp. of which could be developed on the Green River itself. Nine sites in Wyoming are capable of developing 11,100 hp. and twelve in Colorado have a potential output of 201,000 hp.

Overvoltage Devices Meet Laboratory Tests

RESULTS of modern research on the cause of and the protection against excess voltages have produced protective apparatus of various kinds, each with certain definite characteristics. Since none of these is a cure-all, only an exact knowledge of these characteristics will prevent misapplication and possible disappointment. Imitating actual line conditions, E. Flegler has made careful laboratory tests on the five main types of overvoltage protection devices with the aid of a cathode-ray oscillograph and arrived at the following conclusions, as reported in the *Elektrotechnische Zeitschrift* for January 16 and 30, 1930:

1. *Condensers.*—Their main value is impulse wave protection, but long connecting lines or damping resistance in series may reduce their efficiency. With properly adjusted ohmic resistance in series they may avoid resonance phenomena. Overvoltages will rarely be prevented by condensers. With paper as a dielectric, condensers will not reach their full capacity in the first 10^{-7} seconds.

2. *Coils*—Their chief value is also impulse wave protecti ı. They cannot protect against overvoltages. The capacitance of the coil does not affect the action of a coil, but a distinct capacity to ground is detrimental. Coils with an iron core have no value as impulse protectors. The effect of coils in through-going lines is frequently overestimated.

3. *Cables.*—For high currents, a length of cable is often substituted for a coil, but any economically permissible length of cable offers considerably less protection than a condenser.

4. *Spark gaps* with damping resistor serve primarily as overvoltage protection. Their time delay is usually no detriment. Gaps for static and semi-stationary overvoltage phenomena can be designed to function properly and reliably. Stationary overvoltage surges cannot be well guarded against with such spark gaps because the reliability of the series resistance is not yet established. The recently developed and recommended materials with resistance values inverse to impressed voltage may improve this condition, but their performance and reliability have not as yet been sufficiently proved. In addition, such materials diminish the current-carrying capacity to ground.

5. *Valve tubes* serve mainly to protect against dangerous overvoltages without the use of a damping resistor. An ideal valve tube should have the same starting, operating and blocking voltage. This is difficult to obtain, but practical requirements are not as exacting. It would be sufficient to limit the highest voltage on the tube to a value which is safely below the flashover voltage of the installation. In conjunction with properly dimensioned condensers, such tubes offer an excellent protection against all overvoltage phenomena. The present difficulty with valve tubes lies in the impossibility to assure no current consumption when no overvoltages occur. They need, for this reason, a series spark gap, and introduce with it a number of disadvantages. But the most serious drawback (at least for European conditions) is the considerable difference between the starting and blocking voltage, which makes it necessary to set the valve for such a relatively high value as to make protection almost questionable.

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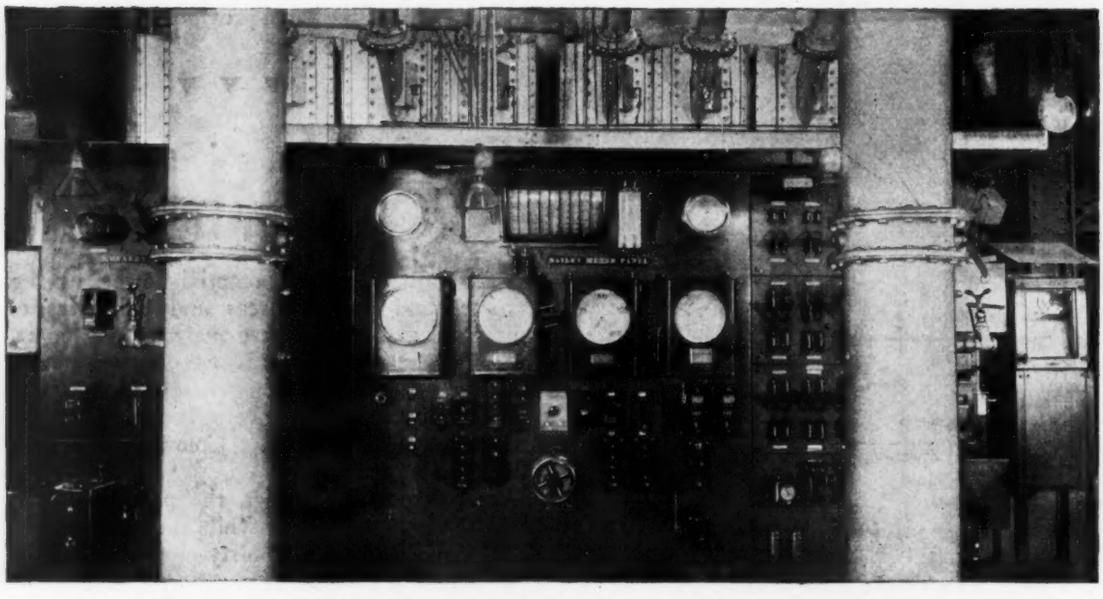
CENTRALIZED CONTROL NEED NOT BE COMPLEX



This recently installed meter panel on one of the pulverized fuel boilers at the Calumet station of the Commonwealth Edison Company in Chicago typifies good modern practice in bringing to a single point control and detailed information on conditions of boiler operation.

Efficiency of the Holding Company

By GEORGE N. TIDD*
President American Gas & Electric Company

JUST as the holding company expert financial staff was able to furnish the service and knowledge which cared for the financial needs of the operating companies, so it quickly became evident that great advantages to the operating companies, and consequently to the public, would result from the holding company's making available to the operating companies expert purchasing staffs, engineering staffs, sales specialists, etc. Thus there became available to the small operating companies the same advantages, not otherwise obtainable by them, which enabled the metropolitan company to give constantly improving service to its customers, extend its facilities to meet demands on it, and at costs and rates with a decreasing trend.

In this business, however, where the service of each part of the system can have its effect on the service furnished by the whole system, the enlargement of plant means very much more than mere addition of units. Complexity accompanies increase in size; and the increase in size of an electrical system to meet public demands means the raising of problems and difficulties and the bringing into play of new forces and strains to provide for which means additional investment. Even the great accomplishment of improved operating efficiency, with consequent reduction in operating costs, and accompanied by improvement in dependability of service, would not have permitted the constantly decreasing rates to customers if the tremendous investments being made were not of a nature to yield the highest possible degree of use.

Interconnection

Because of the number of properties to which it renders service, the holding company can afford the expense of specialized technicians. Further, it can keep them specialized and in perfect training because the combined volume of work keeps them continually occupied and therefore in active practice all the time. The knowledge that has been gathered extending over many years, and very often back to the time of the formation of the property, gives this group that thorough familiarity with the whole system necessary properly to forecast its growth.

So far as this group is concerned, one of the great advantages of holding company affiliation is the securing of the full advantages of interconnection of transmission lines by the subsidiary companies which are contiguous in territories served, in which class are included the subsidiaries handling almost 90 per cent of the total energy of the group.

The economic results of interconnection are so important and holding company managements have had such a large part in the accomplishments that a brief résumé of the merits of interconnection is given:

(a) *Protection of Service.*—The protection of the customer's service by the opportunity of the supplying company securing service from an interconnected system, whereby shortage or failure due to trouble in any one generating plant or transmission line is quickly and in many cases instantaneously relieved.

(b) *Release of Transmission Lines for Repairs.*—Interconnection of transmission lines makes it possible, without suspending customers' service, to take a section of line out of service for repairs, especially week-ends, thus removing the danger of working on live lines and insuring the highest degree of maintenance. Service can be maintained from the interconnected system and fed back as far as the sectionalizing switch.

(c) *Maintenance of Frequency.*—The operation of a large interconnected system, in which the control of frequency is regulated by precision clocks, of necessity provides precision of frequency unattainable with independent small systems, especially when the small systems have heavy fluctuating loads. This precision of frequency provides the customers with speed regulation of motors which is quickly made evident in larger and superior output.

(d) *Maximum Utilization of Water Power.*—Many of our water powers have little storage capacity with a large run-off and others have large storage capacity and a limited amount of water, especially during a dry season. In case of the large run-off and little storage capacity, the maximum output of the waterwheels can be obtained by having the system's interconnections absorb all water-power output in excess of its own requirements

**Based on comprehensive memorandum filed by the company with the Federal Trade Commission and introduced by the commission into proceedings on February 24, 1930.*

—this resulting in a large increase in output for a given quantity of water.

In cases of interconnection of steam and large water-power plants, the short-time peaks can be economically handled by the water-power plant then having storage (and the draw-down for short periods is negligible), thus saving the necessity of starting up generators and keeping in commission batteries of boilers for this service.

(e) *Economy of Operation.*—Each unit of generating equipment has a definite load at which the greatest economy is secured. Many instances arise where the short-hour peak load would necessitate starting up a large generating unit and boilers which would be operated at low capacity and for short periods with poor relative economy. By calling upon the interconnected system the additional load can be spread over a number of stations and can be more economically served by them, thus removing the necessity of maintaining batteries of boilers under bank between peaks and of operating at comparatively poor efficiency any large generator to carry a small load.

THE field of electric service could not have been extended to the present magnitude unless better efficiencies and consequent reduction in operating cost had gone hand in hand with development and growth.

(f) *Staggering Installation of Generating Capacity.*—It is not feasible economically for any company to install exactly the amount of capacity to meet the load and to meet *immediate* growth, for generating units are usually 30,000, 50,000 or 100,000 kw. or more in capacity. It is obvious, then, that when an additional generating unit is installed there will be a period of time when there is a surplus of capacity installed which is unused, and the carrying charges upon this idle excess are a pure loss. If two neighboring companies, as has frequently happened, have entered into an expansion program at the same time, they both wind up with excess, whereas with interconnection, if they stagger their construction programs, the unused capacity of the one company can be made available to the other until exhausted, and the conditions later on reversed, resulting in little or no excess non-earning capacity.

(g) *Reduction in Spare Generating Capacity.*—The interconnected system can be safely operated with a much lower percentage of spare generating capacity than without the interconnection, owing to reliance which can be placed on the other interconnected plants in case of trouble in one. With many interconnections the emergency reserve capacity is spread over the various systems which are interconnected, less capital is tied up in the property, and consequently a lower fixed charge is to be absorbed by the output.

(h) *Diversity of Load.*—Where an electrical system covers a large territory, peak loads of different classes of business very rarely occur simultaneously.

(j) *Increase in Capacity of Transmission Lines.*—By feeding into a transmission line from both directions toward the load the capacity of the line is increased and the losses diminished.

(k) *Initial or Improved Service to "Thin" Territory.*—In many cases the territory traversed by a line forming an interconnection is one which would not itself immediately justify high-class transmission facilities to serve it. When the line is built to form the interconnection it becomes possible to tap it for worth-while business. Besides thus bringing initial or improved service within reach of existing communities and industries this is often an important factor in inducing new industries to locate in such thinly developed territory, and this decentralization of industry is being commonly recognized as a movement which promises great good for the nation.

Interchange of equipment

Affiliation in a holding company group permits a further important extension of the practice of carrying one spare or one set of spares for use wherever needed (all covered by arrangement between the individual companies) and by the possibilities of obtaining standard supplies from affiliated companies in an emergency.

By the interchange of equipment which is surplus or unusable on the properties, such as generator units outgrown at one point but perfectly adaptable for use at some other point, insulators of a voltage discontinued on one property but still in operation on another property, etc., many thousands of dollars' worth of equipment is saved from being sold at scrap or junk value.

While affiliation in a holding company group facilitates the interchange of construction and operating information, tending to reduce costs and improve service, the full possibilities in this direction are attained only when there is systematic interchange of information through a common clearing house.

Training of operating personnel is a very definite expense whether appearing as cost of full-time schooling or represented by the period of inefficient work during which the employee is "learning the business." By using in common the equipment and instructors for these schools, our subsidiaries are enabled to accomplish the work for a fraction of the cost as compared with each company doing its own independently.

The holding company form of organization will always tend to hasten reductions in rates to customers. The separately owned and operated company needs to be very conservative in reductions and in establishing new and lower rate forms because the immediate effect on its earnings statement would apply 100 per cent and might affect its credit adversely, whereas in a holding company group the operating company is in position to initiate a reduction as soon as justified, without the effect being great enough to affect the credit of the group.

Savings in consolidated purchasing

The American Gas & Electric Company subsidiaries operate over a wide area, serving mostly the smaller communities (the average size is less than 2,500 population) and none of them entering the metropolitan centers. Material needs, although great in the aggregate, have no considerable concentration of regular needs at any one point, consequently without the holding company purchasing services they would not be in position to secure the advantages of large-scale buying.

It is axiomatic that the purchaser of material in large quantities enjoys lower prices, better service, closer contacts with market changes, quicker delivery, more prompt and equitable adjustments of differences than the small buyer located at points remote from commercial centers.

This is one very great advantage inherent to the regular purchaser of material in quantity. His business is constantly sought by sellers of goods in the lines bought by him, and his information as to probable or expected price changes is almost invariably excellent and forms a reliable guide as to when and how much to buy, and also when to refrain from making any commitments that are not absolutely necessary.

Materials and equipment used by the subsidiaries in construction, operation and maintenance in 1928 amounted to the sum of $23,859,171.56.

A careful spot check has been made of the purchase of such materials and equipment, which check indicates a saving in cost of $1,982,148.48, or an average of 8.29 per cent of the cost.

The management and engineering skill concentrated in the holding company organization and made available for the immediate improvement of operation of newly acquired properties, as well as the constant progress in efficiency of its existing subsidiaries, has shown some startling results.

THE close contact which the headquarters staff keeps with the physical functioning of the system enables diagnosis and prescription for system troubles as they develop and before they become serious.

The improvement in efficiency of power-station equipment, substation apparatus, line structures and fittings, etc., cannot be left entirely to the manufacturer.

Even assuming that new developments resulting from pioneering work by the holding company organization and the manufacturer will become available finally to the industry as a whole, yet it must be considered that the subsidiaries of the holding company are likely to have had the advantages of the economies, etc., resulting from the new development for months or possibly years before the separately operated company (more especially of a size appropriate to serve the communities within our group) obtains the advantages.

A review of only the last five years shows that the group of operating companies subsidiary to American Gas & Electric Company as then constituted secured a progressive reduction in operating expenses per unit of output whereby the actual expenses for the period were $37,960,171 less than they would have been if the unit cost of the first year of the period (1924) had remained unchanged throughout. This saving in operating costs, which without doubt is the result in large part of the services rendered the operating companies by the parent company technical and executive staff, is shown in the accompanying table.

It is virtually impossible to conceive of the progress that has been made in the engineering side of the electrical industry without the concerted co-operation of expert engineering staffs of the holding companies with the designers on the staffs of the electrical manufacturers. The holding company experts have not merely made available to the operating companies the latest and soundest developments in the technical arts, but they have explored the promising possibilities with a thoroughness that smaller local staffs could never have done, they have encouraged the manufacturers to undertake developments that disjointed adoption by small unco-ordinated companies could never have justified. The pressure or urge which induces the manufacturer to strive constantly to better his product is exerted more effectively by the holding company organizations, not simply in vague demands for something better but in specific recommendations for improved design.

Some of the prominent forward strides in engineering efficiency which have originated in or been furthered by the engineering force of the American Gas & Electric Company are the following:

Power Plant Location at Mine.—The Windsor station was the first of its magnitude to be built at the mouth-of-coal mines, thus avoiding rail transportation of the fuel.

Joint Power Stations.—Joint undertaking and ownership of power stations permitted larger size and better station economy than either company alone could have attained or justified.

Coal-Handling Equipment.—The holding company technical staff designed a new coal-handling scheme which cost less than 40 per cent of the figure bid by contractors.

Furnace for Low-Grade Coal.—Slack, refuse coal and anthracite culm piles are being successfully burned in furnaces designed by the headquarters engineers.

Air Nozzle at Furnace Throat.—A design was devised to obtain turbulency and better combustion and furnace efficiency.

Ventilating Chain Stokers.—The staff developed a scheme for circulating air through the stoker grates to keep them from warping. The air to the stokers is at higher temperature than used anywhere else in the country.

Water Air Economizers.—The A.G.&E. engineers first designed and used this scheme to recover the excess heat in the air to the stokers.

Reclaiming Cinders and Fine Coal.—A nozzle and piping arrangement was developed for use by the subsidiaries whereby the cinders in flue gas and fine coal sifting through the grate are returned to the combustion space.

Ash-Conveying System.—The subsidiaries were the first to use hydraulic pumping of ashes as a result of proposal by the superior engineering staff.

Centralized Boiler Control.—The parent company developed a boiler control switchboard for centralized control alongside the boiler.

Gravity Flow Through Condensers.—Difference in stream levels above and below power station site is utilized to circulate condensing water, saving all the power and machinery ordinarily required for pumping it.

Condenser Design.—A new method of arrangement of and sizes of condenser tubes saves approximately 40 per

American Gas & Electric Group Savings in Operating Expenses

Year	Output of Plants, Thousand Units	Actual Operating Expenses Exclusive of Depreciation and Taxes	Would Have Been on 1924 Basis	Savings
1924	1,360,609	$16,241,106	$16,241,106	.....
1925	1,977,206	20,173,125	23,607,843	3,434,719
1926	2,810,148	25,860,529	33,553,165	7,692,635
1927	2,947,445	24,747,591	35,192,493	10,444,902
1928	3,247,988	22,399,737	38,787,652	16,387,915

cent of the amount of tubing, with reduced cost and better efficiency. Provision for ready reversal of flow effected cleaning of tubes without shutdown or complicated valve installation.

Larger Sizes of Turbines.—The company believes it was the first to install a 30,000-kw. turbine and later the first 165,000-kw. turbine.

Steam Reheat in Turbines.—Although it had not been done before in any country, the American Gas & Electric Company recommended to its subsidiary the Ohio Power Company the installation of a steam plant for 650 lb. pressure to obtain better economies and the use of a steam boiler to reheat the steam from the seventh stage of the turbine and return it to the eighth stage at the initial temperature. Satisfactory results at Philo led to the adoption of the scheme at two other plants and justified going to 1,200 lb. pressure and reheat for a new plant now building.

There have been many other items of advanced design, better performance, lower cost, longer life, standardization, etc., such as standardization of substations, of meters, carrier-current telephone communication, transmission lines, hydrogen-cooled rotating machinery, higher voltage rotating machinery, elimination of interference with telephone communication.

Customer's control equipment

Inasmuch as the thing sold by the operating companies is electric "service" and not a commodity, members of the operating personnel are always available to assist in the application of this service to the customers' needs and co-operate in removing their difficulties. In many cases the operating companies were finding that control equipment installed by customers was not suitable for existing conditions. This led to extended conferences by our parent company staff with manufacturers of control equipment and research at their factories, with the result that new equipment has been developed whereby the customer may obtain the full benefit of the dependable electric service being furnished him.

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Federal Power Commission to Act on Accounts

By PAUL WOOTON
Washington Correspondent ELECTRICAL WORLD

NINE years of effort looking to a Federal Power Commission that would not have to assign its engineering and accounting work to the three departments from which the commission sprang apparently have come to naught.

Under the careful and conservative guidance of O. C. Merrill some progress toward that end was made each year. In the hands of less patient proponents an effort was made to speed up the transition. The big push was precipitated at the hearing when the House committee had the commission's appropriations under consideration. While some sympathy with the proposed change was expressed, the majority of that committee is firmly of the opinion that the bulk of the commission's work should be done through the departments having jurisdiction over federal waters and the public lands. Chairman Wood of the House appropriations committee is outspoken in his determination that no large bureau be built up.

Failing to take even an outpost on the House side, a new offensive was launched on the Senate side. A number of the members of the interstate commerce committee were glad to provide the point of vantage for a demonstration. A mild sensation was created, but impartial observers are convinced that the results have been exactly opposite to those expected. Even Chairman Couzens has expressed the opinion that the three full-time commissioners recommended by the President should be representative of the three departments.

Th anti-utility members of the committee took full advantage of the opportunity to beat their tomtoms and call attention to their belief that a dragon is about to swallow the sun. Even they seem to have lost sight of the real purpose of the hearing. As a matter of fact, it has had the effect of clearing the atmosphere and emphasizing that the proponents of a commission with its own personnel have been the ones who, through their failure to comply with the provisions of the act, are responsible for the accumulation of accounting work. The three secretaries have been aroused to the point where they realize that they must take definite action. As a consequence, it is fully expected that the three departments are going to be requested, in the very near future, to undertake a considerable part of the nine years' accounting which has been deliberately allowed to accumulate. The commission's accounting staff in Washington will review the work done by the field forces of the departments and will pinch-hit whenever the necessity arises.

The fireworks had the effect of centering attention on the work of the commission and revealed that while the accounts for recapture purposes have not been closed no public interest has suffered. They revealed also that the power companies have been granted nothing and that no action of the commission has had any bearing on the rates fixed by the state commissions. No action of the commission has added a cent to any one's bill for power or light.

While the Niagara Falls Power Company and the Byllesby Management Corporation were denied the privilege of appearing at this time, at least, to answer orally the charges made against them, the printed record will contain the written statements which they submitted. It is now more clearly understood, however, that the establishment of the prelicense costs of the companies that were in existence at the time of the passage of the water-power act is a complicated process and involves questions of values which will probably have to be

settled by the courts. Another effect has been to put the power companies on notice that these accounting matters cannot be allowed to drift. The Niagara Falls Company already has requested a hearing before the Power Commission. Arrangements now are being made to hold that hearing in the near future.

The whole proceeding brought F. E. Bonner, the commission's executive secretary, into the limelight. In taking the secretary's post, eight months ago, he became heir to a particularly difficult situation. Since he had no hand in the controversy, which happened to come to a head after he took the secretarial job, he became the goat. Secretary Wilbur has called attention to the fact that the goat always meets trouble head on. This characterized Mr. Bonner's attitude at the hearings. He demonstrated that he has an unusual grasp of the whole hydro-electric situation. He long has been in the government service. He grew up with the water-power act. By expressing the opinion, in answer to a question by the Senate investigators, that the power companies are being persecuted, he called down upon his head the invective of Senator Norris and Senator Wheeler, but this flare of their displeasure is not expected to prevail against his long record of public service and his unqualified indorsement by public ownership advocates, as well as private operators, with whom he long dealt as the California representative of the Forest Service.

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Taxes Consume 10 per Cent

A LARGE fraction of the revenue of electric light and power companies goes into taxes. It ranges around 10 per cent—higher in some states, lower in others.

Assessments are levied largely on the basis of property values. Capital turn-over in the electric power industry is small—to produce a dollar of revenue generally requires an investment of five or six dollars, hence the ratio of taxes to revenue is large.

Through the courtesy of the various state utility commissions, which furnished the necessary statistics, the accompanying table was made possible.

In some states the commissions have jurisdiction over all electric systems, in others only over commercial establishments and not over municipal. These cases are indicated. Omissions are due to lack of available information.

Taxes in per Cent of Revenue

(From data received from state commissions)

State	1927	1928	State	1927	1928
Alabama (*c*)	....	8.5	New Hampshire (*c*)	10.6	....
Arizona (*c*)	7.8	....	New Jersey	10.4	11.0
California (*c*)	11.5	9.9	New York	9.5(*c*)	9.4
Colorado (*c*)	7.5	10.0	Ohio (*c*)	10.0	10.0
Connecticut	7.9	7.8	Oregon (*c*)	12.5	....
Dist. of Col. (*c*)	11.4	9.9	Tennessee	11.1	....
Georgia (*c*)	6.3	....	Vermont	7.4	7.7
Idaho (*c*)	10.9	10.3	Virginia (*c*)	7.0	6.6
Maine	7.9	8.1	Washington (*c*)	9.4	6.7
Massachusetts	11.9	12.2	West Virginia (*c*)	12.5	9.2
Michigan (*c*)	10.0	....	Wisconsin	9.9	10.9
Nevada	9.4	6.6			

(*c*) designates commercial companies; in other instances the returns relate to the entire industry, municipal as well as private plants, in the state.

HENRY FORD Says:

The main trouble everywhere, including America, is that leaders in industry do not properly interpret their difficulties as warnings to change their methods.

Tractor-Powered Winch Speeds Cable Stringing

By J. ELMER HOUSLEY

Superintendent Tallassee Power Company, Alcoa, Tenn.

MISCELLANEOUS parts from old equipment have been utilized in making a power-driven winch used in pulling cable by the Tallassee Power Company in western North Carolina and by the Knoxville Power Company in eastern Tennessee. Coupled to a small tractor, the winch pulled 500,000-circ.mil aluminum cable steel reinforced on a recently finished 150,000-volt line in rough country.

The small cast-iron drum, which was part of an old winch, holds about 3,500 ft. of ⅜-in. steel hoisting rope.

Light, tractor-drawn-and-operated winch for economical line erection

It is driven by the rear axle parts of a light automobile and is coupled direct to the power take-off on the tractor. A shift bar permits the operation of the drum in either direction, although the gears are usually disengaged and the rope pulled out. The outfit is mounted as a trailer on a pair of steel wheels and an axle taken from a piece of farm machinery.

FRANCE Goes Electrical

By DAMON C. WOODS
American Consular Service, Paris, France

THE producers and the principal distributors of electricity in France are grouped in a professional syndicate which represents a capital of 8,500,000,000 francs ($334,600,000), of which 5,000,000,000 is in stock and 3,500,000,000 in bonds and obligations. A syndical evaluation places at 5,000,000 kw. the installed power of the machines of its members. To this total must be added 1,500,000 kw. for the machines installed in the centrals of the Syndical Chamber of Hydraulic Forces, making a grand total of 6,500,000 kw., with a normal available power of 4,000,000 kw.

After the crisis of electricity consumption in 1927, the year 1928 showed a marked recovery. At Paris the consumption rose to the maximum annual figure of 1,796,000,000 kw.-hr., 13 per cent greater than the total for 1927 and more than three times the 534,000,000 kw.-hr. consumed in 1920. Installed power at Paris in 1928 rose 9 per cent above the total for 1927 and the number of subscribers for electrical energy increased by 9 per cent.

Course of recent hydro-electric development

From 1923 to 1927 the thermal production of electricity in France increased from 4,089,000,000 to 6,930,000,000 kw.-hr., while the hydraulic production advanced from 3,405,000,000 to 4,945,000,000 kw.-hr. During 1928 the construction of new hydro-electric plants totalled 43,965 kw. normal service capacity; this marked a recession from the 73,308 kw. installed in 1927 and but slightly exceeded the 42,280 kw. construction in 1926. Concessions accorded in 1927 called for 165,512 kw. of normal productive capacity, while those issued in 1928 totaled only 75,624 kw.

The potential hydraulic force in France is officially placed at 9,000,000 hp. Of this total, 2,100,000 hp. is in actual use, of which 1,700,000 hp. drives electrical machinery. France ranks after Norway and Russia in potential water power and probably second in Europe, after Italy, in developed power. The principal water-power regions in France are the northern Alps, with 2,000,000 potential and 750,000 utilized horsepower; the southern Alps, with 2,400,000 potential and 250,000 developed horsepower; the Pyrenees, with 2,000,000 potential horsepower and 360,000 harnessed kilowatts, and the Central Plateau, with 1,300,000 potential horsepower and 300,000 working kilowatts.

Interconnection of lines

Through interconnection and unification of lines, a network of conductors carrying 120,000 to 150,000 volts stretches over the greater part of France. Already it is possible to use electrical energy from the Pyrenees nearly to Paris on the one side, and from the Swiss border stations to Lyons and Dijon on the other. A line now under construction will connect Saint-Étienne to La Truyère, thus supplying the link between the Alps and the Pyrenees.

With the aid of important contributions from the state for rural electrical development, it is foreseen that the program for the complete electrification of France will be achieved within ten years. At present more than 75 per cent of the local districts, containing 90 per cent of the population, are electrified. The per capita annual consumption of energy is 260 kw.-hr. It is believed that this can be increased to 1,000 kw.-hr.

Nearly all of the distribution is made by the use of a three-phase alternating current at 50 cycles per second. The only periodic exception is the transmission system of the Energie Electrique du Littoral Méditerranéen. Between the Alps and Lyons a direct current on the Thury system operates up to a maximum of 150,000 volts. The Midi and Orleans railways also employ direct current at an average of 1,500 volts for their electrified lines.

The secondary systems of distribution generally carry voltages of 5,000 to 15,000. In cities, including Paris, the usual frequency is 110 volts and in the country districts it is 220 and 380 volts.

Cost factors affecting hydro-electric progress

The cost of electrical energy in France is very low, as compared with that in other countries, being on an average 3.19 cents for lighting and 1.88 cents for motive power per kilowatt-hour. Production costs must therefore be kept at a minimum, and this necessity has curtailed some of the more extensive plans for hydro-electrification.

The price at Paris per metric ton of anthracite coal used in the steam plants generating electricity rose from $6.16 in the fourth quarter of 1928 to $7.32 in October, 1929. In some electric "centrals" situated near the coal mines it has been possible to reduce the fuel cost

by using the latest chemical processes for extracting tar, oils and other products, leaving only coke, semi-coke or gas to be used in the generation of electrical energy.

An important point favoring steam- or gas-powered electric plants in France is that they remain the permanent property of their owner and do not depend upon concessions. Furthermore, their cost of construction is much less than that of water-driven plants. Large steam-operated centrals cost at present $31.65 per horsepower, against $100 to $120 for hydro-electric plants.

On the other hand, the heavy initial cost of water-power plants is offset in the long run by the absence of fuel expense. In a few decades, therefore, it is probable that coal and its byproducts will be displaced for all but small local units in the French electrical system.

Geographical situation of the hydro-electric systems

A line traced on the map of France from Wissembourg on the northeastern frontier to the mouth of the Gironde, above Bordeaux, divides the country into two nearly equal parts. The northeastern part denotes the thermo-electric domain and the southwestern part represents the hydro-electric region. While there are stations of either sort in the territory attributed to the other, the 32 departments to the northwest of the line have more than 70 per cent of the installed thermal electric power and produce more than 80 per cent of the total thermo-electric energy generated in the entire country.

These divisions are explained by the fact that the northwestern half of France is marked by fairly level topography and is endowed with coal mines, in addition to being adjacent to the anthracite sources of Belgium and Great Britain, while the southeastern half, as outlined, is favored with an abundance of rivers and waterfalls.

The complete national plan for the electrification of France involves the junction of lines from the Pyrenees with those from the Alps and the Massif Central and the interconnection of this unified hydraulic power with that from the great steam-driven plants of the Paris region and the north of France, so that eventually it will be possible to supply electrical energy for the entire nation from the hydro-electric sources, without dependence upon foreign coal supply. In conformity to this general plan, the following developments are in progress:

The Compagnie d'Interconnexion Rhône-Eguzon has just obtained the concession for the construction and exploitation of a line at 90,000 volts between Champvert (Nièvre) and Theillay (Loir et Cher). This line will be joined at Champvert with an existing line at 90,000 volts belonging to the Compagnie Bourguignonne, and at Theillay with the double 90,000-volt line of the Paris-Orleans Railway. The last named artery connects the centrals of Eguzon and Gennevilliers, with transformation at 90,000/60,000 volts, to Chevilly (Seine). It will soon be doubled by a line of 150,000 volts, part of which, between Eguzon and Chaingy (a suburb of Orleans), has already been constructed.

This line (Champvert-Theillay) will operate then as a liaison between the plants of the Lyons region and the Alps on the one side and those of Eguzon and Gennevilliers on the other. At Gennevilliers, across the Seine from Paris, is the 350,000-kw. steam-driven central of the Société d'Electricité de Paris, which supplies energy to the northern suburbs of Paris and furnishes tractive force to the Paris underground and surface street railways. It is thus seen that it will ultimately be possible, should economic factors or a sudden catastrophe intervene, to replace the present energy source for these enterprises with hydro-electric power conveyed from the Massif Central, or, as an alternative, from the French Alps.

The Champvert-Thiellay supplementary 150,000-volt line has been completed between Champvert and Garchizy (Nièvre) and supplies of material have been made ready for the section between Garchizy and Bourges. It will have a total length of 140 km. The wire used will be aluminum-steel (core of steel) of 148 square millimeters in cross-section and capable of carrying 20,000 kw.

Following the extension of this 150,000-volt line to Paris, it will be prolonged into the Nord Department, thus bringing about a junction between the hydro-electric centrals of the Alps, Massif Central and Pyrenees and the thermal plants near the coal mines of the north. Concessions have also been granted recently for the construction of a 220,000-volt line from Chaingy (Orleans) to Paris and for a similar line from Chaingy to Marèges, in the Massif Central. These lines, totaling over 330 miles in length, will be put up by the Paris-Orleans Railway. As in other cases, an arrangement will be made with a Paris distribution company for utilizing the current brought to the capital.

The reason for joining feeders from both the Massif Central and the Alps centrals to the distribution systems of the Paris region lies in the fact that the water power from the former source is heaviest in the winter months, while the melting snows of the Alps yield a maximum of hydraulic force in the summer.

Government policy in aid of electrification

The French government grants concessions for hydraulic electrical works for 50 and 75 years with rights of eminent domain and a clause reserving to the state the option to acquire the properties at the end of the concession, or on violation of its terms. Construction plans must be approved by the Ministry of Public Works.

In the promotion of rural electrification, the government grants subventions and loans at 2 per cent interest to communes or groups of communes desiring to obtain electrical energy for the agrarian districts. This aid is extended through the Ministry of Agriculture.

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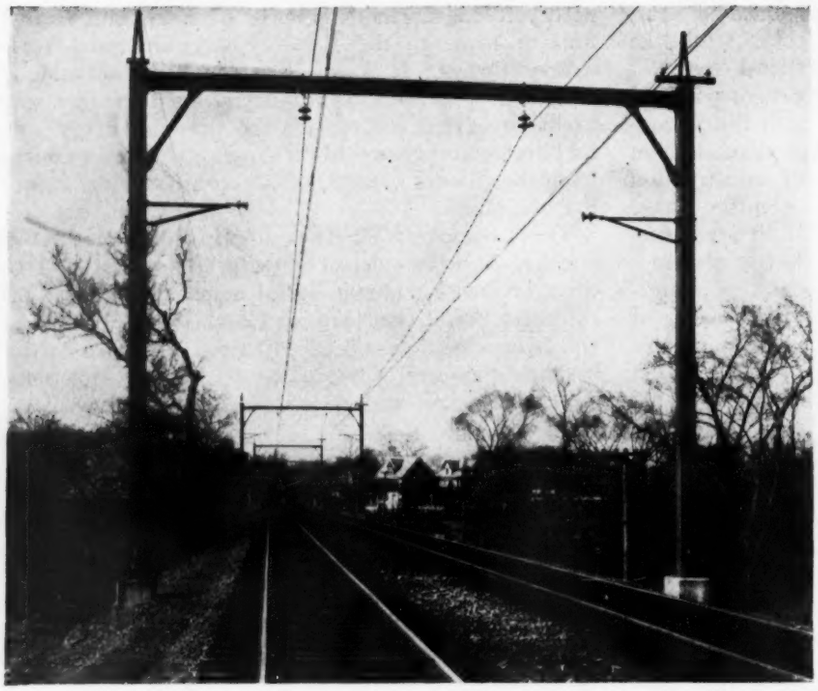
Distance that Lightning Wave Can Travel on Transmission Line

Excerpt from Tokio paper by F. W. Peek, Jr., General Electric Company. These data show that a badly exposed section of a line could be highly overinsulated without much danger of subjecting the normally insulated section to excessive voltages. It is only necessary to extend the highly insulated line several spans beyond the exposed section.

Lightning Voltage, Kv.	Distance of Travel for Reduction to Half Voltage		Distance to Travel for Reduction to 0.80 Voltage	
	Kilometers	Miles	Kilometers	Miles
4,000	2.4	1.5	0.6	0.4
3,000	3.3	2.1	0.8	0.5
2,000	4.8	3.0	1.1	0.7
1,000	10.0	6.3	2.5	1.6



Lackawanna

By E. L. MORELAND

Jackson & Moreland, Consulting Engineers, Boston, Mass.

RAILROAD electrification has gained some interesting new exponents in the past year or so. In metropolitan areas the problem of the increasing density of terminal and suburban traffic has caused transportation men some real thought for its economic solution.

THE Lackawanna, with one of the heaviest of commuter traffic loads, has joined the cause of electrification. No little courage and originality have been displayed. Mercury-arc rectifiers are used exclusively. Multiple-unit trains, total absence of any feeds to sections except through the catenaries, 3,000-volt direct-current operation and supply from three utility companies at four voltages are some of the features.

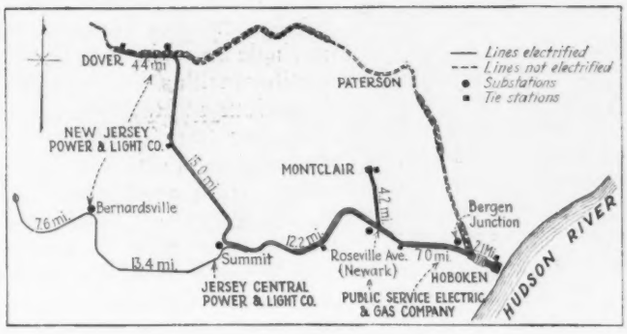
ELECTRIC operation of approximately 40 miles of heavy-traffic density main line and 25 miles of branch lines, both devoted largely to suburban commuter service, on the Delaware, Lackawanna & Western Railroad will, it is anticipated, permit better train operation, relieve congestion, eliminate most of the smoke nuisance in a 1¼-mile tunnel and minimize future traffic problems in a rapidly growing area of dense population.*

In selecting the type of operation to be adopted primary consideration was given to the fact that virtually all of the traffic involved was commuter service and multiple-unit trains were judged to offer the maximum flexibility for the purpose. The units consist of one motor car and trailer in semi-permanent coupling, the combination of one to six units constituting a train. Motor cars were purchased. Cars now in service are being converted for trailer operation. There will be, initially, 282 cars, 141 motors and 141 trailers in use. Four motors per motor car, operating in series-parallel, 1,500 volts on each motor, are being provided.

Mercury-arc rectifiers were selected largely because of their higher efficiency as compared with motor-generator sets, particularly at light loads, and their high overload capacity under unusual conditions. Notable savings in size of substation structure required also contributed to the decision to use the rectifiers. A standardized layout of apparatus and connections, subject to variations, was developed and an accompanying figure illustrates the features of it. The introduction of an excited insulated grid in the General Electric 3,000-kw., twelve-phase rectifiers offers vastly improved performance of the units and this is the first commercial use of this equipment. It will be installed in all the Lackawanna substations. The grid is excited by an alternating-current potential, 12-15 deg. in advance of the potential imposed on the anode. The effect is to ionize and deionize the mercury vapor in front of the anode and results in the successful carrying of small currents without extinguishment of the arc; it also tends to prevent arc-back. The results of studies of relative efficiencies of motor-generator sets and mercury-arc rectifiers are summarized in an accompanying illustration.

**From an address by Mr. Moreland before the transportation group, New York section, American Institute of Electrical Engineers, March meeting.*

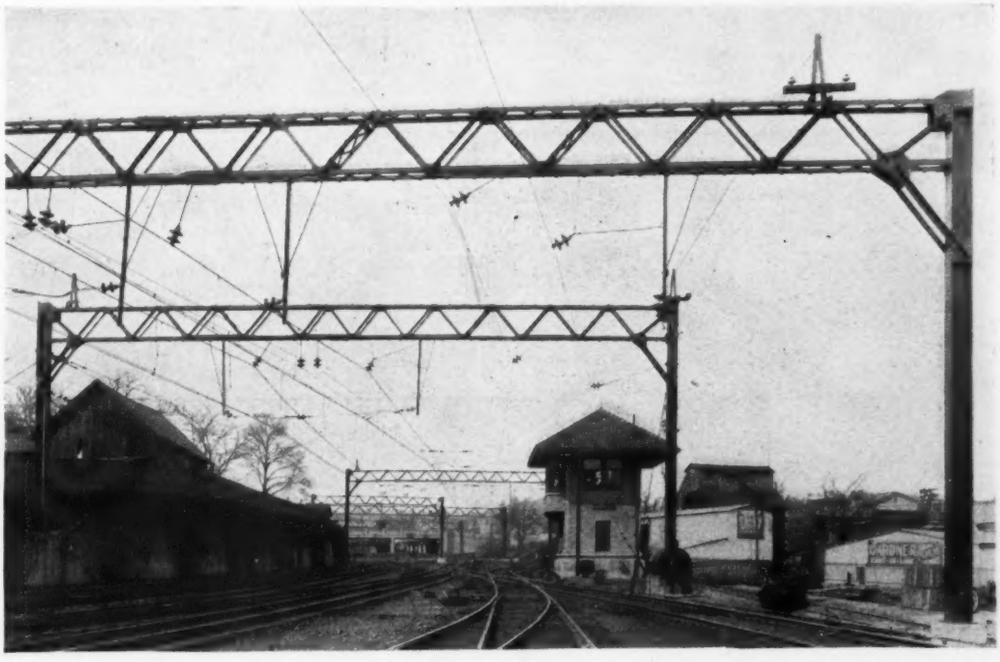
Electrification Relies Upon Mercury-Arc Rectifiers



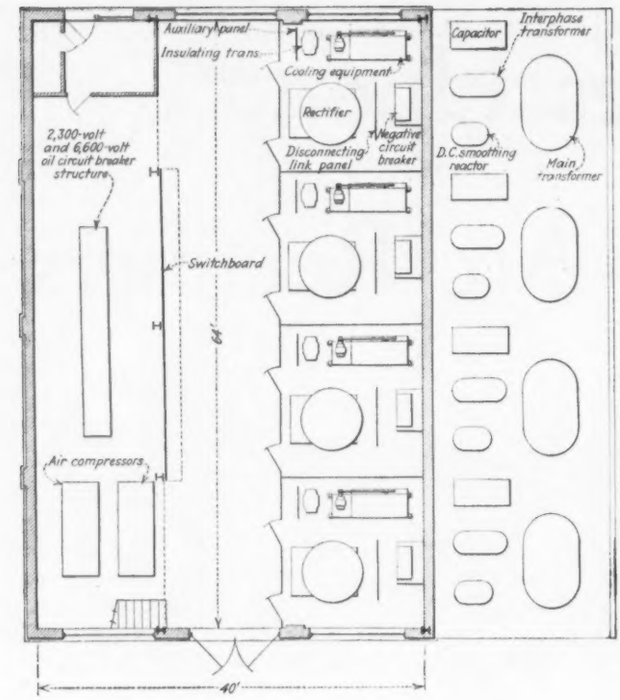
Three utility companies supply energy for suburban electrification

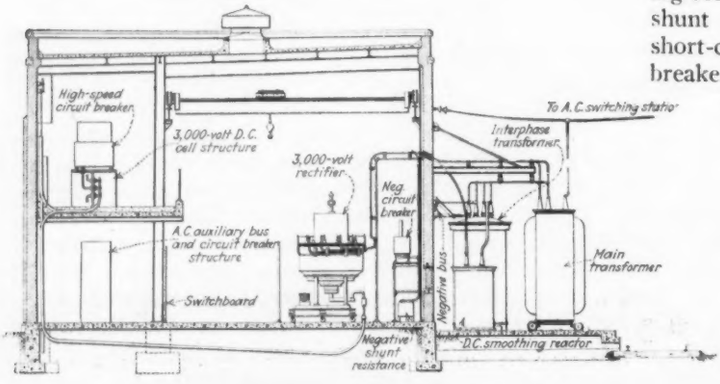
Tests made with these 3,000-kw. rectifiers showed satisfactory performance under all conditions. Overloads of 50 per cent for two hours, 200 per cent for five minutes and 500 per cent for fifteen seconds were carried. Substantially flat voltage characteristics are obtained up to 150 per cent of full-load rating by a compounding scheme utilizing capacitors. The direct-current smoothing reactor indicated in the typical layout serves to smooth out the voltage curve. Resonant shunts are also provided to eliminate harmonics which would cause disturbance on telephone and other communication circuits. The power factor is substantially unity at full load and overloads. Water cooling with forced circulation and subsequent radiator cooling of that medium is used for the rectifier tank itself. The transformers are oil-filled, self-cooling.

Three utility companies supply energy to the electrified system, and as it proved impossible to secure their concerted action for a single contract separate service agreements were made. Each delivers alternating current direct to the railroad substation. The Public Service Electric & Gas Company serves the eastern end, at West End substation (Bergen Junction), at 13,000 volts, and at Roseville Avenue (Newark) at 26,000 volts. The Jersey Central Power & Light Company serves Summit at 66,000 volts. The New Jersey Power & Light Company serves Bernardsville and Denville at 33,000 volts. These five substations, four located at junction points,



Yard construction at end branch line (Montclair)





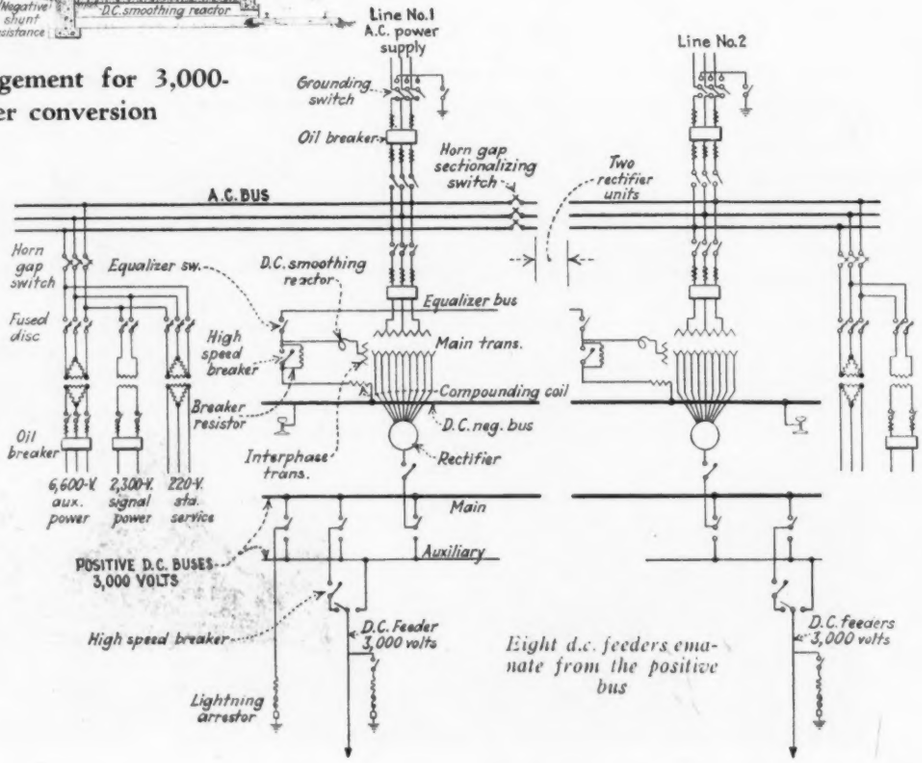
Typical substation arrangement for 3,000-volt mercury rectifier conversion

are normally used, with the provision, however, that in case of interruption to the railroad supply line the other line will be automatically switched in, giving, in effect, duplicate service.

Since the probable demand of the operating department would insist on having attendants even with fully automatic equipment in main line substations, manual operation has been used except at Bernardsville, which is fully automatic with supervisory control from Summit. The tie stations, which are really high-speed air-break sectionalizing stations, have supervisory control from the nearest operating tower.

In the substations each mercury-arc rectifier has its own main and interphase transformer and capacitor and feeds the direct-current bus as shown in the accompanying illustration. The main bus and transfer bus operate as single buses, but can be sectionalized. Three 3,000-kw. rectifiers with a spare rectifier tank are provided at West End, four at Roseville Avenue, four rectifiers supplied from two transformers at Summit, the same at Denville and two rectifiers with two transformers at Bernardsville. High-speed circuit breakers are used for feeds to the catenaries. These are of the familiar air-break, arc-chute, magnetic blow-out type which close against a spring under solenoid control and with an opposing winding for accelerated opening under overload. An inductive shunt makes the breaker self-distinguishing between short-circuit and overload currents and enables the breaker to open under short circuits before heavy short-circuit currents can build up. Each main line track and catenary is independent of the others

General arrangement of rectifiers, feeders and protective equipment in substation



Eight d.c. feeders emanate from the positive bus

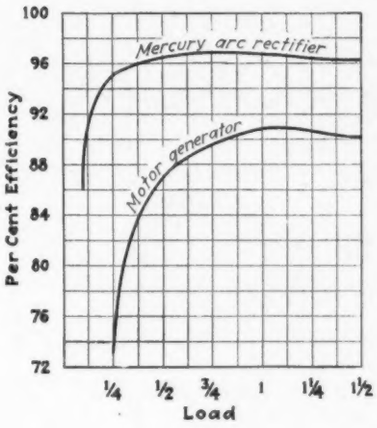
feed directly into the catenary system without any branch feeder circuits, so that the overhead construction is greatly simplified. Sectionalized construction is used with air-break rather than wood-stick sectionalization.

Continuity of supply is amply provided for — three cables, one a spare, go to West End (Bergen Junction); two, one a spare, run to Roseville Avenue, and other stations are supplied by overhead lines, with duplicate circuits. At Bernardsville, in order to separate the railroad supply circuit from the local electric service to the community, exclusive circuits

in this electrification plan, the only exceptions being at the end of the stub lines.

Feeders in the four attended substations, as indicated previously, are not automatic reclosing. Tie station breakers open on a short and remain open until the section is energized from the other end. Breakers on stub-end lines close a predetermined number of times and then lock out.

An unusual type of catenary support whose columns are held by but two foundation bolts, rather than the customary four, has been adopted. Main messenger wires are of bronze-core, copper-stranded construction.



Higher efficiencies, particularly at light loads, led to adoption of rectifiers rather than motor generator sets

Auxiliary messenger is No. 2/0 stranded, and there are two No. 4/0 contact wires, 55 per cent bronze. Two pantographs, spring raised and air lowered, on self-aligning roller bearings, are installed on each motor car, but only one is to be in use at any one time. The working range is 9 ft. 9 in. Single contact shoes have been ordered for 50 units, the remainder being of the double type.

To insure adequate ventilation of the driving motors air is drawn through louvers on the roof of the motor cars, thence through ducts in the side of the car and through a flexible sleeve to the self-ventilating motor. Fuses of the combined expulsion and compression type are provided on the roof of each motor car. Lightning arresters are also provided on each motor car. Dynamotors provide 32-volt energy for lighting, battery charging and control. Car heating is by 3,000-volt units under the seats.

Not all Lackawanna traffic can be thus provided for. The Paterson line, with heavy freight traffic and considerable passenger operation, is at present being electrified for freight only as far as the Secaucus yard, about 4 miles from the Hoboken terminal. One ¾-mile tunnel through Bergen hill, just west of Hoboken, will be entirely freed of steam locomotives and the other freed about one-half. Through-express trains and some freight movement will continue to be steam operated. Local freight will be handled by locomotives of the three-power, catenary-Diesel-storage battery type. They will weigh 248,000 lb., with all the weight on the drivers, have a tractive effort of 60,000 lb. and be driven by four 400-hp. motors.

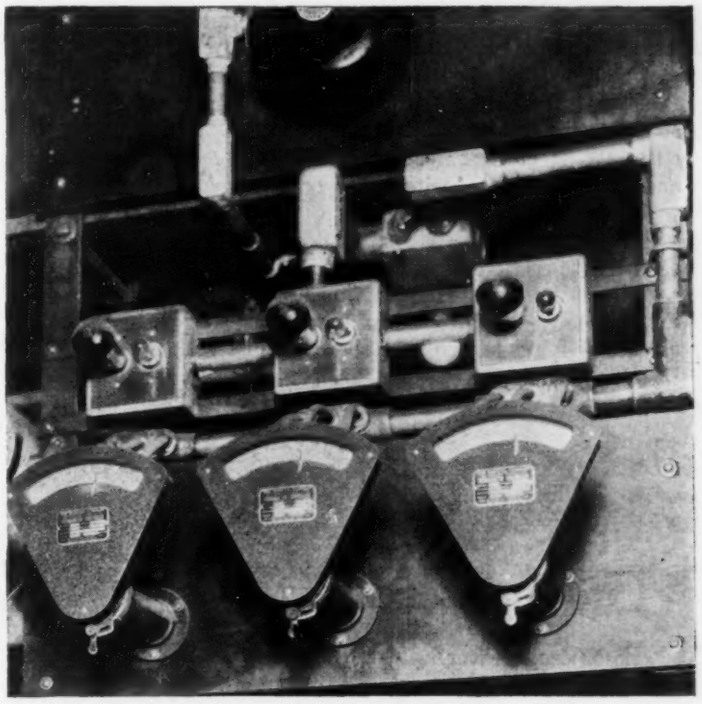
Electric Melting of Stereotype Plates Gains Headway

SINCE the pioneer application of electric melting of stereotype metal five years ago at Waterbury, Conn., the conversion of fuel-fired pots to electricity has been proceeding at an increasing rate. "Today about 19 per cent of the newspaper circulation of the United States is printed from electrically melted plates," stated R. M. Keeney at the recent New York convention of the American Institute of Mining and Metallurgical Engineers. In a paper on the "Melting and Annealing of Non-Ferrous Metals," Mr. Keeney pointed out that 86 newspapers in twenty-two states with more than 7,000,000 circulation now use electric stereotype pots. These usually range in capacity from 1 to 10 tons and most of them were originally designed for gas operation. The problem of electric application was greatly simplified by the design of a suitable immersion heater.

Stereotype metal varies in composition, but the average of five newspaper plants was: Tin, 5.6 per cent; antimony, 14.1 per cent; lead, 80.3 per cent. The pouring temperature, depending on thickness of plate and metal analysis, is between 550 and 775 deg. F.

The rapid growth of electric melting of stereotype metal has been due to:

1. Practically all gas pots used at the outset of electric melting were non-insulated and without automatic control. In a great number of newspaper offices under these conditions electric melting is actually cheaper than gas on a thermal basis, since for each heat unit consumed in the automatically controlled and insulated electric pot three heat units must be expended in the uninsulated and hand-controlled gas pot.



Temperature control has made marked strides of late in melting operations

2. In many large newspaper offices depending on power presses and electrically operated lintoypes electricity is cheaper than the automatically controlled and insulated gas pot on the heat basis in many cases and reasonably competitive in smaller offices. According to Apmann, insulation of the gas pot reduces gas consumption 27 per cent and automatic control results in some saving. This means that in the modern sterotype gas pot two heat units must be consumed to produce the result of one electrical heat unit.

3. Improvement of working conditions has been a powerful factor in increasing the use of electric melting; particularly in large newspaper plants, even with insulated gas pots, the removal of products of combustion is very difficult with the casting room in the basement.

4. Experience indicates a lower maintenance cost of electric pots as compared with gas. Pot life has always been a problem with gas melting on account of unequal strains set up when melting cold metal if heat is applied from the outside instead of within as in the electric pot. In four years of continuous operation the total maintenance on the first electric stereotype pot of the Waterbury *Republican American* has consisted in the free replacement of three elements which burned out in early operation, due to blowholes in the castings. The cost of the heating element is only about $50, and the failure of an element in no way affects the publication of the paper as it can be replaced without a shut-down. The pot simply melts a little more slowly while the element is out of service.

5. The cost of electrifying an uninsulated gas pot is little greater than the cost of insulating the gas pot and equipping it with automatic control.

The advantages of automatic control are shared equally by electric and gas pots, although the electric pot owner may enjoy less lag and more rapid melting.

On one newspaper an 8-ton automatically insulated gas pot melting at about the same rate as a 9-ton electric pot consumed 460 cu.ft. of gas per ton melted, the power consumption of the electric pot being 24 kw.-hr. per ton. On another large paper having a 7-ton modern gas and a 7-ton electric pot the gas consumption was 680 cu.ft. per ton and the electric consumed 34 kw.-hr. per ton. In each case power at 2 cents per kilowatt-hour is competitive with gas at $1 per 1,000 cu.ft.; with electricity at 1.5 cents per kilowatt-hour, possibly about the average of the country for this class of service, the equivalent price for gas is 75 cents.

J. L. Faden, Boston, emphasized the point that in the average newspaper plant the demand for stereotype metal melting precedes the press run as the plates after casting are used on the presses. Hence the total electrical demand of the plant is not increased a great deal by the use of electric melting. In five large newspaper plants using electric melting the original plant demand was only increased 13 per cent over the electrical capacity of the stereotype pots added. This generally means that electricity for melting is obtainable at a low rate. One city newspaper, having a daily circulation of 300,000 and using two 8-ton electric stereotype metal pots, melts 1,335 tons of metal per month with an electrical consumption of 20 kw.-hr. per 1,000 lb. of metal cast.

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Doubts Efficacy of Ground Leads

THE efficacy of vertical ground wires on wood poles was raised in question at a recent meeting of the Southeastern Division of the N.E.L.A. Some companies reported freedom from pole and crossarm shattering by lightning, but had experienced burning of crossarms. Others had the opposite experience with ungrounded wood poles, but felt it was cheaper to replace the few ruined than to ground all of them. The Florida Power & Light Company, for instance, has 70 miles of line with ground wires; in two years 317 guyed poles and 109 unguyed poles were shattered; half of the 3 per cent of damaged poles had to be replaced. A suggestion was made by one of the delegates present at the convention that the overhead systems committee undertake a survey to ascertain the economic efficacy of grounding wood poles.

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READERS' FORUM

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1,000,000-Kva. Breaker

To the Editor of the ELECTRICAL WORLD:

In the item regarding the single-tank three-phase breaker published on page 604 of ELECTRICAL WORLD, March 22, an error was made in the second line, stating "1,000-kva. rupturing capacity." because the original article referred to it as of 1,000 Mva. (megawatts), which means 1,000,000 kva.

Pittsfield, Mass. **A. PALME.**

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Resents General Accusation and Reports 100% Co-operation

To the Editor of the ELECTRICAL WORLD:

The writer is glad that an appropriate title was selected for the published "interview with William Van Alen, architect," which was given space in the ELECTRICAL WORLD of March 15, 1930. The title, "Co-operation as One Architect Sees It," would be a perfect headline if the word "one" could be printed in red.

Few consulting engineers, architects and other technical men of my acquaintance would, even "speaking frankly," accuse his professional associates of not knowing "what they were talking about," especially when speaking of them as a class.

Those of us who have studied lighting problems and applied our knowledge have done so with full appreciation of the fact that improvement in the art would be materially advanced by co-operation with architects—*mutual co-operation.* Indeed, the writer has never met an architect, in some fifteen years of professional activity, who has not joined with interest and appreciation in a discussion of his lighting problems. Such expressions as are attributed to Mr. Van Alen do not dignify his profession nor do they accurately reflect discredit on the engineer.

PROF. C. D. FAWCETT.

Moore School of Electrical Engineering,
University of Pennsylvania, Philadelphia.

Men of the Industry

A. L. Powell Assumes Charge of Eastern Office of Lamp Works

A. L. POWELL, widely known for his many and varied activities in the field of illuminating engineering, has been named manager of the eastern engineering branch of the Edison Lamp Works and the National Lamp Works of the General Electric Company. Graduating from the school of electrical engineering, Columbia University, in 1910 Mr. Powell entered the employ of the Edison Lamp Works that same year. It was

during this connection that his first work on illuminating engineering problems was done.

Mr. Powell's efforts and knowledge of lighting principles and practices led him to Europe in 1924, where he investigated lighting conditions and cooperated with various European interests throughout England, France, Germany and Italy in lighting development. The year following his return he was appointed manager of the engineering department of the Edison Lamp Works, which position he has held until his recent appointment.

In 1928 Mr. Powell served as chairman of the program committee of the International Illumination Congress, which met in this country. At the present time he is a member and sectional officer of the American Institute of Electrical Engineers, chairman of the light in architecture and decoration committee of the Illuminating Engineering Society and a member of the convention hall lighting committee of the society. Mr. Powell is consulting editor for *Lighting* and the author of many articles on the varied phases of lighting.

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Original British Electricity Commissioner Retires

SIR HARRY HAWARD retired from the office of British Electricity Commissioner March 31, on completion of his extended term of office. Sir Harry, who is 67 years of age, is one of the original five Electricity Commissioners appointed in 1920 under the electricity supply act, 1919. Before his appointment he held the office of Comptroller of the London County Council for 26 years, during which time he was actively engaged for many years in the investigation of various aspects of the finances of the public utility undertakings of London, including those relating to electricity supply and the financial problems connected with the supply of electricity in the London area. Although he ceases to hold office Sir Harry will act in a consultative capacity.

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L. B. HERRINGTON, president of the Kentucky Utilities Company, has been elected president of the Lexington Utilities Company to succeed P. M. Chandler of New York. Martin Insull and Samuel Insull, Jr., were named directors.

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R. E. HELLMUND, chief electrical engineer of the Westinghouse Electric & Manufacturing Company, has just been elected a member of the board of directors of the German Institute of Electrical Engineers.

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WILLIAM H. WILDES, formerly vice-president and a director of E. H. Rollins & Sons, has become executive vice-president of the Central Public Service Corporation.

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FRED H. LUECKE, division manager of the Central Illinois Public Service Company at Mattoon, has become president of the Missouri Public Service Company at Warrensburg, Mo. Both are properties of the Middle West Utilities Company. E. B. Doocy, division manager at Beardstown, succeeded Mr. Luecke at Mattoon.

W. L. Emmet Awarded A.S.M.E. Medal

WILLIAM LE ROY EMMET, consulting engineer of the General Electric Company, has been awarded the American Society of Mechanical Engineers Medal for distinguished service in engineering and science. This signal honor is being bestowed on Mr. Emmet for his contributions to the development of the steam turbine, electric propulsion of ships and their generating apparatus. The presentation will be made Tuesday

afternoon, April 8, by Charles Piez, president of the society.

Mr. Emmet was graduated from the U. S. Naval Academy in 1881, but two years after his graduation he resigned from the navy to take up electrical engineering. He has been associated since 1892 with the General Electric Company, except for the period of the Spanish-American War, when he reentered the navy. Mr. Emmet's most important work has been in steam-turbine inventions and developments and the invention of the mercury-vapor power process. He has been a member of the American Society of Mechanical Engineers since 1902 and is a past-vice-president of the American Institute of Electrical Engineers. He was awarded the Edison medal in 1919 and the Elliott Cresson medal in 1920.

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B. V. HARRISON of New Liskeard, Ont., has been appointed vice-president and general manager of the Canada

Northern Power Corporation, Ltd. Mr. Harrison has been connected with power companies serving northern Ontario for the past twenty years. In July, 1927, he was appointed general manager of Canada Northern Power Corporation and two years later was elected to the board of directors. Mr. Harrison has also been appointed vice-president and general manager of Northern Ontario Power Company, Ltd., and Northern Quebec Power Company, Ltd.

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ROY R. BURNHAM has resumed the practice of consulting engineering with offices in Boston, Mass. Mr. Burnham recently resigned as treasurer of the Walworth, English & Flett Company, Boston, after about six years' association with that house. He was in independent engineering practice at Boston from 1919 to 1924 and during the war was in charge of the electrical engineering at the Boston army and Squantum naval bases.

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A. P. GALE, for nearly four years manager of the Beloit division of the Wisconsin Power & Light Company, with headquarters in Beloit, has been transferred to Fond du Lac, where he has been promoted to the management of the entire eastern division of the organization. He will have charge of the districts of Sheboygan, Fond du Lac, Oshkosh and Clintonville, together with all the motor bus and street railway systems operated by the company excepting the bus line at Janesville. Mr. Gale will be succeeded as manager of the Beloit division by James G. Allen, who has been manager of the Lake Geneva division, which has been consolidated with the Beloit division.

W. Jacobs Elected Vice-President Belden Company

WHIPPLE JACOBS, general sales manager of the Belden Manufacturing Company, manufacturer of electrical wire, cable and cordage, with manufacturing plants in Chicago, Ill., and Richmond, Ind., was elected as vice-president of the company at the last meeting of the

directors. Mr. Jacobs started with the Belden Manufacturing Company immediately upon leaving school in 1914. With the exception of two years overseas duty during the World War he has been with the company since that time.

Entering the cost department he has been, successively, chief inspector, general storekeeper, purchasing agent and production manager and general sales manager.

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OBITUARY

EDMUND H. TARBELL, for many years a partner in the lighting fixture house of the E. H. Tarbell Company, Boston, Mass., died on March 19 at his home in Newton Highlands, Mass. He was a native of Boston and his business had been carried on for two generations before he became its head.

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KARL L. NORRIS, vice-president of the Wetmore-Savage Electrical Supply Company, Boston, Mass., and one of the best-known executives in the New England jobbing field, died at Boston, March 23, after a short illness. He was born at West Burke, Vt., 51 years ago and had long been identified with the wholesaling of electrical products in the eastern Massachusetts territory. Mr. Norris was active in the Metropolitan Electrical League of Boston, in the New England division of the National Electric Light Association and in civic affairs. He was a vice-president of the Saugus Co-operative Bank.

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LEWIS E. GETTLE, 67, chairman of the Wisconsin Railroad Commission, died at Madison, March 18. He had been in poor health for nearly a year. Mr. Gettle's first state position was that of library commissioner, which he held from 1894 to 1898. During this term he studied law at the University of Wisconsin and graduated in 1898. After practicing law at Edgerton, Wis., for several years, he was elected in 1911 to the Wisconsin Assembly, where he served one term. From 1912 until 1915 he served as secretary of the Wisconsin Railroad Commission, being appointed Railroad Commissioner in 1921 and reappointed in 1927. In 1928 he was elected president of the National Association of Railroad and Public Utility Commissioners.

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RICHARD N. MATHER, formerly electrical manufacturer and an inventor of note, died March 27 at his home in Hartford, Conn. Mr. Mather, who was 73 years of age, was born in Windsor, Conn. In 1882 Mr. Mather, in association with others, organized the Mather Electrical Company, North Manchester, Conn., but after several years as a manufacturer he sold his interests in the enterprise. For years he occupied himself with electrical inventions.

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JOHN KREUSI, Chattanooga manufacturer, died in that city at the home of his brother March 26, following a three days' illness. Mr. Kreusi was only 37 years of age. His father was associated with Thomas A. Edison in the inventor's early experiments and when the former died Mr. Edison became guardian of the son. Mr. Kreusi spent two years at Union College and then matriculated at Cornell University, from which institution he was graduated. Then he entered the employ of the Detroit Edison Company, remaining until the World War. In 1920 he removed to Chattanooga, becoming associated with his brother as vice-president and manager of the American Lava Company. At the beginning of this year he became president.

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A. A. CAMPBELL SWINTON, F.R.S., died in London, England, February 19, at the age of 66. Following the completion of his education, Mr. Swinton spent six years in the Armstrong engineering works at Newcastle-on-Tyne. He then settled in London as a consulting electrical engineer, and in addition he became chairman of Crompton & Company and also associated with Sir Charles Parsons in the development of the steam turbine. After Röntgen had discovered the X-rays in 1895, Mr. Swinton was one of the first in England to experiment with them and applied himself to the improvement of the tubes in which they were produced. As far back as 1908 he suggested the possibility of television, or "distant electric vision" as he called it, by means of cathode rays. In radio he found a congenial study. In 1914 he proposed an ingenious method of recording signals, the movements caused in a sensitive manometric flame by the sounds from a telephone receiver being photographed on a moving strip of sensitized paper.

Financial and Statistical News

UTILITY common stocks were again leaders in the upward movement early this week with several point gains in such issues as Electric Power & Light, Consolidated Gas, American Water Works and North American. Smaller gains were made by a long list of other stocks before profit taking set in.

——FIRST QUARTER REPORTS INDICATE a 6.5 per cent gain over the first quarter last year both in energy sales and in revenue.

——EASY CREDIT STILL IS THE MOST IMPORTANT day-to-day factor in the stock markets. The bond market has felt such credit tightening as has taken place.

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Southern California Edison Offers Bonds Locally

THROUGH ITS OWN INVESTMENT department the Southern California Edison Company is offering to the medium and small investor in Southern California additional refunding mortgage bonds, series of 5s, due 1954, amounting to $5,000,000. These bonds have not been syndicated through any bond house. Proceeds will be used to finance, in part, capital expenditures for additions and betterments to properties.

Stockholders approved amendments to the articles of incorporation providing for a change of name from the present designation to the Southern California Edison Company, Ltd., a reclassification of the preferred stock by increasing the preferred stock, series B, 6 per cent, from $50,000,000 to $53,000,000 and the 5½ per cent preferred, series C, from $45,000,000 to $66,000,000, at the same time reducing the 7 per cent preferred stock, series A, from $30,000,000 to $27,000,000 and eliminating all of the $21,000,000 preferred stock, series D, 5 per cent, none of which has been issued.

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Niagara Hudson Stockholders to Vote on Merger

STOCKHOLDERS OF THE Niagara Hudson Power Corporation will be asked at their annual meeting on April 8 to vote on a plan to consolidate the Mohawk Hudson Power Corporation and the Niagara Hudson Power Corporation into a new company bearing the name of the latter. Stockholders of the Northeastern Power Corporation at a meeting held April 9 will be asked to approve the sale to the Niagara Hudson Power Corporation of substantially all of the company's property and assets in exchange for sufficient stock and warrants of Niagara Hudson Power to permit distribution to holders of each common share of $2\frac{2}{3}$ shares of common stock and one class A option warrant to purchase $\frac{2}{3}$ share of Niagara Hudson common stock.

Following the consolidation of Niagara Hudson with Mohawk Hudson and the acquisition of assets of Northeastern Power the capitalization of the new Niagara Hudson Power Corporation will be as follows:

	Stocks Authorized	Shares Outstanding
Preferred stocks, $7 series	5,000,000	657,851
Common stock	50,000,000	26,588,599
Class A warrants	10,000,000	8,498,647
Class B warrants	1,750,000	1,494,951
Class C warrants	2,250,000	2,244,000

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New Investment Trust Organized

FORMATION OF THE Standard Utilities, Inc., under the laws of Maryland for the purpose of acquiring common stocks of public utility companies has been announced. The authorized capitalization of this new organization consists of 1,000,000 shares of common stock and 10,000 shares of class B stock. The board of directors at present consists of officers of John Nickerson & Company, Inc.

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Merger Would Eliminate Costly Coast Competition

ELIMINATION of the costly and uneconomic competition between operating utilities on the Pacific Coast will at last be eliminated if the California Railroad Commission ratifies the proposed amalgamation of the North American Company and Pacific Gas & Electric Company interests. Through its subsidiary, the Western Power Company, North American Company will become the largest stockholder in the Pacific Gas & Electric Company through ownership of more than 32 per cent of its outstanding common stock. According to Frank L. Dame, president of the North American Company, "Coordination of facilities and administration is expected to be of increasing benefit to customers and stockholders and will result in better service to all customers, economies in operation, more efficient use of existing plant facilities, unification of construction programs to meet future requirements and the avoidance of future duplication of large capital investment."

North American Company has had large investments in California utilities for at least five years. Under the terms of the agreement just reached this company's subsidiary, Western Power Corporation, will acquire from Pacific Gas & Electric Company 1,825,000 shares of common stock to be issued in exchange for Western Power Corporation's holdings in Great Western Power Company of California, San Joaquin Light & Power Corporation and Midland Counties Public Service Corporation, in addition to the cancellation of $19,000,000 of their floating indebtedness.

In short, the arrangement provides that North American Company will secure what is presumably a working control of Pacific Gas & Electric system and at the same time transfer its California subsidiaries to a subsidiary of the Pacific Gas & Electric Company, thus consolidating the system. The North American Company, incidentally, does not maintain a central management or engineering organization in connection with the operation of any of

its subsidiaries. Each group of properties is under the management of local officers directly responsible for operation and construction.

Further diversification of operations

From the standpoint of North American Company itself the proposed consolidation will substantially increase the scope of North American interests in California and will further diversify the investment of North American Company through participation in an extensive natural gas development and in electric service furnished in territories in which the North American subsidiaries have not operated heretofore. The combined properties will continue under the management of the group now in charge of operations in California. The combined interconnected power system of the Pacific Gas & Electric Company with the properties of Great Western Power Company, California; San Joaquin Light & Power Company and Midland Counties Public Service Corporation will extend nearly 500 miles in central and northern California, serving a territory having an area of 75,000 square miles and a population of approximately 2,500,000 and embracing more than 350 communities.

Gross earnings of North American Company and subsidiaries for the calendar year 1929 were $147,779,869, while those of Pacific Gas & Electric Company were $64,819,618, making a total of more than $212,000,000. The total electric plant capacity of North American systems at the end of 1929 was 1,988,202 kw. and that of the Coast system 603,475 kw. From the standpoint of gross revenue the North American system will thus be increased by 44 per cent if the merger is consummated.

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Energy Output Low in February

THE ENERGY OUTPUT of public utility plants in February was only 3 per cent greater than that of the same month for 1929, according to statistics compiled by the U. S. Geological Survey. The total output was 7,623,946,000 kw.-hr., which makes the average daily production about 2½ per cent smaller than that of January, whereas in a normal year the average daily production for the two months is about the same. Electric railway as well as other plants producing energy for public consumption are included in the Geological Survey figures, together with central stations for electric light and power.

The percentage increase of output is not only smaller than it was for January (5 per cent) for the country as a whole but is smaller in each section of the country individually, except New England, where the output for both January and February was virtually the same as for the two corresponding months of 1929. For five regions the increase, compared with February, 1929, was fair, ranging from 4 to 7 per cent, but it is somewhat unusual that three of the geographical regions should show a decrease, even a small one. The East North Central States lost 1 per cent, the East South Central and the Mountain States 3 per cent each.

Presented in this way the impression is naturally produced that two important productive regions are exceptionally inactive. But the statement is somewhat misleading unless account is also taken of conditions in 1929. It happens that in February, 1929, New England showed an increase of 10 per cent, and the East North Central States of 12 per cent, compared with February, 1928. If the comparison is made with that year a two-year increase appears, amounting to 10 per cent for New England and 9 per cent for the great industrial area of the upper Mississippi Valley.

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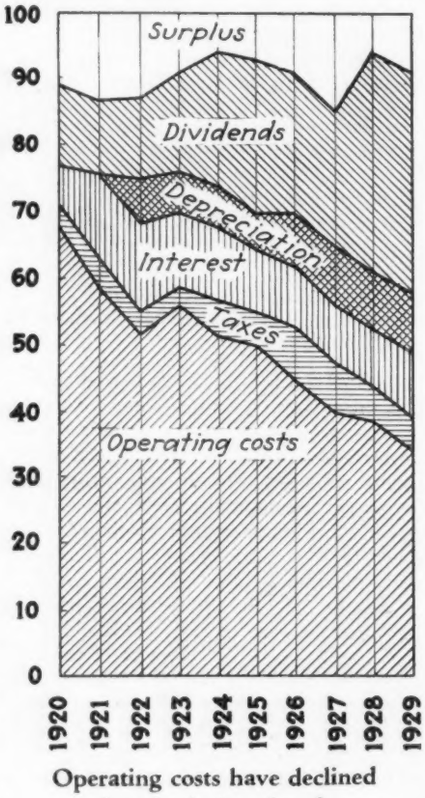
Duquesne Light Reduces Its Operating Costs

ONE of the few utilities whose 1929 operations show an actual cut in operating costs while earnings continued their upward trend is the Duquesne Light Company. Its operating ratio was reduced from 40.9 per cent in 1928 to 38.2 per cent last year and in spite of large reductions in wholesale power rates gross earnings increased by about 4 per cent and net earnings by 8.2 per cent.



Operating costs have declined sharply during decade

Assets of the Duquesne Light Company at the end of 1929 totaled $185,314,397. Of this, plant account, including construction work in progress, was $159,872,259. Gross earnings amounted to 17.8 per cent of this or the investment amounted to $5.59 per dollar of gross revenue.

Duquesne Light Company has shown a steady if conservative growth over a period of years. Assets have increased almost 58 per cent in the past five years and gross earnings over the same period have grown approximately 28 per cent.

The financial structure of Duquesne Light Company is one of the least complex among the larger utilities. There is a 4½ per cent bond issue, totaling $65,000,000; common stock to the amount of 2,000,000 shares and 275,000 shares of preferred stock. No permanent financing was carried on by the company last year.

The company's surplus at the end of 1029 was $15,815,379, against $12,272,857 at the beginning of the year, a growth of nearly 30 per cent.

Despite unfavorable business conditions toward the end of the year, the company showed substantial growth. There were 11,717 customers and 121,662 kw. of connected load added to the system, an increase during the year of 4.01 per cent in customers and 17.96 per cent in connected load. A peak load of 309,500 kw. was recorded during the year, representing an increase of 14,200 kw., or 4.81 per cent. The maximum daily output of 5,400,448 kw.-hr. was 213,984 kw.-hr., or 4.13 per cent, greater than the maximum daily output in 1928, establishing a new high record. The output of 1,573,445,327 kw.-hr. for 1929 represents an increase over 1928 of 139,260,303 kw.-hr., or 9.71 per cent. The average consumption per residential customer in 1929 was 672 kw.-hr., compared with 649 in 1928 and 638 in 1927.

Associated Gas Changes Subsidiaries' Set-up

FOUR UNDERLYING OPERATING COMPANIES of the Associated Gas & Electric System in the State of New York will be eliminated as a result of a series of mergers just announced. The Eastern New York Electric & Gas Company, formed of 23 separate companies, is acquiring all the stock of and merging with the Harlem Valley Electric Corporation. The Eastern New York company is controlled by the New York State Electric Corporation.

The Elmira Water, Light & Railroad Company, which is controlled by the Rochester Central Power Corporation, is acquiring all the stock of and merging with the Beaver Dams Light & Power Company, Inc. The Empire Gas & Electric Company is acquiring all the outstanding stocks of and merging with the Marcellus Lighting Company, Inc., and the Jordan Electric Light & Power Company. The Empire company is a subsidiary of the New York Central Electric Corporation, controlled by the Rochester Central Power Corporation. Both the New York State Electric Corporation and the Rochester Central Power Corporation are controlled by the Associated Gas & Electric Company.

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Canadian Utility Makes Ten Million Dollar Offering

AN ISSUE OF British Columbia Power Corporation, Ltd., 5½ per cent first refunding and collateral trust sinking fund gold bonds totaling $10,000,000, has just been offered. The bonds are classified as series A, dated March 1, 1930, and reach maturity March 1, 1960. The bonds are being offered to the public at $98 and accrued interest, to yield over 5⅝ per cent. Proceeds of this issue will be used in connection with the Ruskin and Bridge River development, and for other corporate purposes.

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Financing in First Quarter Totals $401,000,000

ELECTRIC LIGHT AND POWER companies of the country during the first quarter of 1930 offered new securities, including bonds, stocks and notes, to the amount of $401,042,500, as compared with $416,180,500 during the similar period of 1929, a decrease of only 3.76 per cent. If a substantial increase had not occurred during the month of March the total recorded for the first quarter of the current year would not have compared so favorably with that of the previous year. March contributed $118,512,500, as compared with $65,530,000 in February and $174,270,500 in March, 1929.

Though the bond offerings were plentiful, not a single stock offering appeared during January or February, but in March five preferred stock issues were brought out. The average rate of return yielded the investor is on the up grade, ranging from 5.64 per cent in January to 5.84 in February, receding to the 5.81 per cent mark in March.

NEWS BRIEFS

Directors of the Galveston-Houston Electric Company have voted to defer payment of the $3 semi-annual cumulative preferred dividend normally payable March 15, 1930, in order to refinance notes maturing June 1, 1931.

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Stockholders of Illinois Power & Light Corporation have approved an increase in the authorized common stock to 800,000 shares from 600,000.

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New York Stock Exchange has authorized the listing of 5 per cent debentures, series C, of the North American Edison Company to the amount of $25,000,000.

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Tennessee Railroad and Public Utilities Commission has authorized the Knoxville Power & Light Company to increase its working capital from $298,000 to $500,000 for its combined utility properties operated in Knoxville and contiguous territory.

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General Gas & Electric Corporation has filed a certificate at Dover, Del., increasing the capital stock from 4,400,000 to 15,000,000 shares, all no par.

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Stockholders of Penn Central Light & Power Company of record of March 22 of $5 and $2.80 cumulative preferred stock will be offered rights to subscribe on or before April 30, at 12 per cent and 8 per cent, respectively, of their holdings, to $2.80 cumulative preferred stock at $46 a share.

NEW SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN MARCH

Name of Company	Amount of Issue Par Value	Period Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Arkansas Power & Light Co.	$6,000,000	26	First and refunding mortgage gold bonds	To reimburse for expenditures made for property additions and acquisitions, to provide funds for carrying on construction program and for other corporate purposes	5	94¾	5.36
	3,000,000	...	Cumulative preferred stock.		6	100	6
American & Foreign Power Co., Inc.	50,000,000	100	Gold debentures	To retire interest-bearing indebtedness of the company	5	90	5.55
Central West Public Service Co.	1,050,000	26	First lien collateral old bonds, series B.	To reimburse for cost of purchased property, additions, and extensions and for other corporate purposes	5½	90	6.25
Pennsylvania Water & Power Co.	1,750,000	38	First refunding mortgage gold bonds, series B.	To reimburse for expenditures made on extensions to plant, property and equipment	4½	91	5
Washington Gas & Electric Co.	2,000,000	30	First lien and general mortgage gold bonds		6	96½	6.25
American Commonwealths Power Corp.	10,000,000	10	Convertible gold debentures	To retire debentures, bank indebtedness and for other corporate purposes	6	96.16	6.25
United American Utilities, Inc.	2,500,000	10	Convertible gold bonds, series A.	To acquire properties and securities, to reimburse for such expenditures and for other corporate purposes	6	98	6.25
Gulf States Utilities Co.	2,462,500	...	Preferred stock	To finance the cost of additions to property represented by floating debt and for other corporate purposes	6	98½	6.09
Standard Gas & Electric Co.	9,900,000	...	Prior preference cumulative stock	To invest in subsidiary and affiliated companies and for other corporate purposes	6	99	6.06
National Public Service Corp.	4,850,000	...	Convertible preferred stock.		3½	48½	7.21
Associated Gas & Electric Co.	10,000,000	20	Convertible debentures	To retire indebtedness of the company and its subsidiaries and for the acquisition of additional properties	5	91	5.76
West Penn. Electric Co.	5,000,000	100	Gold debentures	Working capital and for other corporate purposes	5	93	5.37
American Superpower Corp.	10,000,000	...	First preferred stock		6	100	6
Total			$118,512,500	Rights		$13,676,790	
Total amount actually realized			108,747,313	Total financing for March		122,424,103	

Business News and Markets

Has Business Come Back?

Electrical industry had very creditable first quarter. Sales of manufactured products up 10 per cent

WHILE several adverse factors still influence the general business situation, the bottom has been touched and the trend is now upward. How wide the trough will be remains to be seen. This is the consensus of opinion of a group of business paper editors who spoke over the Columbia Broadcasting System Tuesday, April 1, on a coast-to-coast network following conferences with President Hoover, Secretary of Commerce Lamont, Secretary of Labor Davis, Julius Barnes, chairman of the Board of the United States Chamber of Commerce and director of the National Business Survey Conference, and Assistant Secretary of Commerce Klein.

Paul Wooton, Washington correspondent of the McGraw-Hill publications and the New Orleans *Times-Picayune*, opened the presentation by explaining the scope and importance of the business press.

Electrical industry in strong position

"Business is good in the electrical industry at the present time," L. W. W. Morrow, editor of the ELECTRICAL WORLD, said. "In electrical equipment manufacturing sales for the first quarter of this year are 10 per cent greater than those recorded in the first quarter of last year, and prospects are good for the remainder of the year. Even the number of radio sets sold is 4 per cent greater this year than last year up to April 1, although the dollar volume of sales is 15 to 20 per cent less. In practically every line of electrical products, except two or three, the business in the first quarter of this year exceeds that of the same period in the record business year of 1929.

"The light and power companies are spending $913,000,000 this year. Up to April 1 their new capital expenditures for added facilities aggregated approximately $300,000,000, and this is not the construction season. Expenditures of this kind are about 10 per cent higher than those for the corresponding period last year.

"In the financial market the utilities have issued securities aggregating $391,000,000, as compared with $415,000,000 during the first quarter of last year, and utility stocks have recovered approximately half of their October and November losses.

Utility revenues up 6.5 per cent

"Utility energy sales and revenues for the first quarter are about 6.5 per cent greater than those prevailing the first quarter of last year. The normal increase is about 8 per cent, and the slight decrease may be explained by the falling off in some industrial loads and the abnormal sales in the first quarter of last year. Each section of the country reports a slight slackening of energy sales to industrial establishments during January and February, but it is felt that the low point has been reached and that industries are improving as gaged by their use of power.

"Thus, all branches of the electrical industry, with the exception of the contracting firms that build industrial plants, report good business for the first quarter of 1930, and their expectations are that this business condition will prevail during the remainder of the year."

G. D. Crain, Jr., president of the National Conference of Business Paper Editors and publisher of *Class* and *Industrial Marketing*, expressed optimism in regard to the outlook. He referred to improving employment, hence buying power, and recovering construction activities. "The most important element," Mr. Crain said, "in any business situation is sentiment. Sentiment among manufacturers is generally cheerful, and it will be more cheerful among retailers as soon as Easter buying really gets under way."

Referring to the agricultural and general food situation, Paul I. Aldrich, editor of the *National Provisioner* and publisher of the *New Era in Food Distribution*, said: "There have been evidences in the last two weeks of the check in the decline of commodity prices all along the line. . . . Those concerns which have 'stepped up' sales and advertising effort in every case report more business than a year ago, and on a sounder credit basis."

"For the three months ended yesterday the showing of iron and steel is surprisingly good," said W. W. Macon, editor of *Iron Age*. "When all is said, at 75 per cent of capacity present output can hardly be considered as discouraging. It should represent, as it has in the past, a scale of activity that is more than sufficient, with any approach to stability in prices, to meet regular dividend requirements without the need of digging into surplus for the purpose."

Covering the general business situation, Dr. Virgil Jordan, economist of *The Business Week*, said in part: "Business has not come back if coming means returning to the levels of this time last year, or even to fairly normal levels in most lines. Last year at this time we were near the peak of a boom, and there will be no more booms like that one for a long time to come, thank Heaven.

First quarter was irregular

"We are now entering a season of spring expansion, and business will undoubtedly feel some of the stimulus of this season, but probably not as much as usual. There will probably be another period of slackness in midsummer, as there usually is.

"The first quarter of this year was irregular and disappointing and failed to bear out the promise of quick recovery which we anticipated in January. The second quarter, now beginning, will at best be about as good as the same period of 1928, when we were coming out of the great Ford slump, but we shall not see business back to normal—that is, where it should be considering the normal growth of industry and trade from year to year—much before this fall, and perhaps not at all this year. Before then we may expect one or more mild setbacks in the stock market.

"The banks have done as much as they safely could to prepare the way for business revival. They can hardly go much farther in that way without stimulating a speculative fever which might further weaken the patient. Easy money is a powerful tonic. The banks may supply it, but they cannot make business take it. It is now plainly up to business men to show their confidence, be more willing to take a chance and put some of this money to work in ways that will put more people to work."

Coffin Awards to General Electric Employees

OF THE 70,000 employees of the General Electric Company, 37 who during 1929 saved money for the company or contributed to its efficiency in an unusual degree have received awards under the Charles A. Coffin Foundation. The awards in each case consist of a certificate of merit and a substantial sum of money. Many made suggestions which mean a definite annual saving to the company. In nine cases these savings have been estimated and the total figures up to more than $1,250,000 per year. These achievements are mostly technical, but each is an instance of ingenuity, skill and perseverance.

The Charles A. Coffin Foundation was created in 1922 by the directors of the company at the time of the retirement of the late Charles A. Coffin, the company's founder and first president.

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"Helping to Sell" Replaces "Asking to Buy"

CLOSE CO-OPERATION among sign manufacturers, central stations, sign contractors and lamp manufacturers is the keynote of future success of electrical advertising, according to lectures and discussions at the Electrical Advertising School held at the Westinghouse Lighting Institute, Grand Central Palace, New York, February 26, 27 and 28 by the New York Section of the National Electric Light Association.

At the first morning session Earl Whitehorne, McGraw-Hill Publishing Company, said:

"In selling electrical advertising you must have a reason other than the desire to build up a larger load factor for the utility or for a personal desire to make a sales commission. The 'ask-them-to-buy' days are gone. We are now living in an era of 'helping to sell.' You must forget any selfish interests and talk from the viewpoint of the prospect. Show him how you can make more sales for him."

Other speakers on the subject of sales in relation to electrical advertising reiterated this thought. Both Mr. Neale, Rainbow Lights Company, Los Angeles, Calif., and Wray White, American Sign Corporation, Kalamazoo, Mich., told how they used similar tactics to sell their particular products.

Sign manufacturers expressed the general thought that more co-operation from the utilities and lamp manufacturers is essential to greater success of electrical advertising. They explained the need for prospect leads gathered by these two organizations to be given to one or more sign companies. Representatives of the utilities explained such activity was already followed by many, and that further development can be expected in the future. Utilities are thus benefited by increased loads, but it makes prosperity for every one connected with electrical advertising.

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Manufacturer Optimistic Over Export Market

OPTIMISM OVER THE European export market as a field for the American manufacturer of time-control equipment was expressed lately by E. E. Spencer, president of the Stromberg Electric Company, who left for Europe March 31. Mr. Spencer is planning to establish representatives for his company, which manufactures various types of time-recording and control apparatus, in seven foreign countries.

"Increasing industrialization of Europe on the American model," Mr. Spencer said, "is creating vast additional markets for American corporations which have developed office appliances and control apparatus so widely employed in large-scale industry in this country. The United States has a long lead in the production of such devices, and its pioneering efforts are being repaid in the great expansion of the export markets for these products in recent years."

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Construction Very Active in Certain Branches

WHILE IT IS TRUE that the construction industry as a whole is suffering a period of depression, certain branches of it are, on the contrary, enjoying a satisfactory degree of activity.

Business of the Stone & Webster Engineering Corporation consists largely in the design and construction of plants for manufacturing and public utility corporations for the purpose of increasing their production. The trend of their business may, therefore, be taken as a measure of the confidence with which the heads of these corporations are viewing their prospects for the future.

The following figures show the volume of construction work completed by the Stone & Webster corporation monthly during the last six months:

September, 1929	$5,126,000
October, 1929	4,914,000
November, 1929	5,484,000
December, 1929	4,988,000
January, 1930	5,792,000
February, 1930	5,587,000

The uncompleted part of contracts on March 1 of this year amounted to $89,373,000, the highest in the corporation's history. This compares with $43,297,000 a year ago.

Central station construction budgets for 1930 announced January 1 were 6 per cent higher than for 1929 and new projects announced since that time will increase budgets by $20,000,000. Generation of electrical energy for the first two months is 6.8 per cent higher than for the corresponding period of 1929, in comparison with 11 per cent increase for 1929 over 1928. New generating capacity to be added this year represents 133 per cent increase over last year and 24 per cent increase over the average of the last seven years. Sales of appliances to build up domestic consumption have increased sufficiently to offset the slight reduction which has taken place in industrial load. Slack building conditions have affected electrical contractors everywhere except in southern California.

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TRADE BRIEFS

At the annual meeting of shareholders March 14, the name the Ohio Electric Manufacturing Company was adopted in place of the former name, the Ohio Electric & Controller Company.

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Eureka Vacuum Cleaner Company, Detroit, announces a 51 per cent increase in unit sales for January, 1930, compared to the same month a year ago.

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Graybar Electric Company, San Francisco, has announced removal of its offices and warehouse from 680 Folsom Street to Ninth and Howard Streets.

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Trumbull Electric Manufacturing Company has moved its San Francisco headquarters from 595 Mission Street to 432 Fourth Street.

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Robbins & Myers Sales, Inc., Springfield, Ohio, announce the appointment of R. F. Marshall, of its advertising department, as advertising manager.

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W. N. Matthews Corporation has appointed Ernest H. Bradley New England sales manager to handle all sales matters in the New England States. His headquarters will be Room 1001 Statler Building, Boston, Mass.

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Market Prices Unchanged

	March 26, 1930 Cents per Pound	April 2, 1930 Cents per Pound
Copper, electrolytic	18	18
Lead, Am. S. & R. price	5.75	5.75
Antimony	8	8
Nickel, ingot	35	35
Zinc, spots	5.20	5.20
Tin, straits	37½	37
Aluminum, 99 per cent	24.30	24.30

Market Conditions

THE end of the first quarter finds equipment business generally on a basis which compares well with the first 1929 quarter. Equipment sales in the East are heavier and inquiries show improvement. Railroad electrification business is active.

——NEW ENGLAND AND THE SOUTHEAST continue to report slight improvement and both large equipment. Appliance sales on the Pacific Coast are holding steady, but no radical improvement has yet taken place.

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PACIFIC COAST

—THE OUTSTANDING EVENT *of the week is the merger of the North American-Pacific Gas group of companies, representing $650,000,000 assets, 1,200,000 customers and nearly $100,000,000 annual revenue.*

—INTENSIVE CREATIVE COMMERCIAL CAMPAIGNS *are expected eventually, but the general feeling is that they will await the immediate merger problems and that machinery purchases, especially transformers, will decrease.*

Spurred by gas competition and despite warm weather, heater manufacturers are actively working on selling campaigns. Contractors and dealers' business is better, with special work and items predominating, such as show window lighting and good clock and refrigerator sales. General conditions are perceptibly better, though inertia of March still hampers any immediate reaction.

Westinghouse reports $20,000 worth of mine machinery sold to a copper mine of Miami, Ariz., $18,000 worth of motors for a Washington lumber plant, $40,000 worth of transformers for Portland and $20,000 worth of rotors and stators for a Los Angeles pumping plant manufacturer. They also report one carload of ranges each for Seattle and Portland. General Electric reports sales of $5,000 worth of motors and motor-generator sets for a Eureka lumber plant, $20,000 worth of potential transformers for San Francisco and a waterwheel generator plant for an Idaho lumber plant.

The Board of Contracts and Awards, Tacoma, is taking bids until April 7 for one 15-kv. cell type, eleven 7.5-kv. truck type and twenty 7.5-kv. panel type oil circuit breakers, also for three 15-kv. single-phase reactors, five 1,000-kva. single-phase, self-cooled transformers, ten 15-kv. single-pole disconnecting switches, two steam boilers complete with superheaters, fans, fuel-burning equipment and structural supports, steaming capacity of boilers 134,000 lb. per hour at 410 lb., 725 deg. F.; also for the construction complete with appurtenances of intake structure for municipal steam power plant No. 2. Apparatus sales were at a minimum last week, but motor orders included 75 ¾-hp. machines to a Seattle pump manufacturer, 24 from 40 hp. down to scattered industrials, ten from 25 hp. down to a machinery house, twenty from 50 hp. down to scattered mills and allied woodworking plants, twenty from 40 hp. down to irrigation districts, thirteen to dealers in the Grays Harbor district and 30 from 50 hp. down to pulp mills and scattered industrials. Pacific Telephone & Telegraph Company will spend about $25,000 in Port Angeles replacing poles, crossarms and cable.

CONSTRUCTION PROJECTS

San Joaquin Light & Power Company, Fresno, Calif., has plans for a group of power substations to cost $500,000, including transmission lines. Los Angeles, San Francisco, Santa Barbara, Pomona and Redwood City, Calif., plan ornamental lighting systems. Great Western Power Company, San Francisco, Calif., plans addition to power substation to cost $400,000. Portland Electric Power Company, Portland, Ore., will build addition to Three Links power station to cost $125,000. Pacific Development Company, Olympia, Wash., plans hydro-electric power plant on Sauk River, Skagit County, to cost $5,000,000. Washington Water Power Company, Spokane, Wash., plans extensions in transmission lines in Cœur d'Alene, Idaho, district, to cost over $400,000.

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NEW ENGLAND

—ELECTRICAL EQUIPMENT SALES *in New England are steady; industrial equipment is active. Inquiries are coming in in good volume. Motor sales are active.*

Recently orders for electrical equipment to replace steam generation included fourteen 100-hp. motors for a New Hampshire mill. This installation also included new turbo-generators, one 1,500 kw. and one 500 kw., and involved a contract for 5,200 kw. per year on a five-year basis. Central-station supplies are spotty and scheduled materials are steady. Orders for crossarms and line hardware for line extensions are active; recently orders received by one company for pole line equipment amounted to over $20,000. Specialties in power control are attracting attention, among which are noted increasing demands for marine electrical equipment. Orders amounting to over $200,000 were placed during the past month in this district for marine applications.

Interior electric lighting projects are numerous and, according to one prominent distributor, projects, in particular institutional types, are in greater volume at this time than last year. Electric arc welding equipment is gaining in interest; recently a number of units for structural work were placed by a prominent manufacturer. Electrical merchandising sales show a gain over last year, according to reports from a group of central stations in this district.

CONSTRUCTION PROJECTS

Pacific Mills, Inc., Dover, N. H., will electrify textile mill, replacing all steam-operated equipment, and has awarded a contract to the Twin State Gas & Electric Company for power supply, totaling 5,200 kw. United Electric Light Company, Springfield, Mass., has plans for a power substation to cost over $100,000. Edison Electric Illuminating Company, Boston, Mass., will build a switching station on L Street, and substation on Scotia Street. Central Massachusetts Electric Company, Palmer, Mass., will erect a new substation at East Longmeadow, Mass., costing about $45,000.

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SOUTHWEST

—AT THE END OF THE *first three months of 1930 the electrical industry business in St. Louis district does not compare favorably with the same period of last year, according to approximate estimates. Business shows a falling off of almost 50 per cent from last year.*

The past week has shown a marked improvement in sales of miscellaneous items from stock; one large order reported was the purchase by one of the electric railways of motor equipment for revamping of cars at cost of $23,000.

CONSTRUCTION PROJECTS

Standard Oil Company, St. Louis, Mo., will build a power plant at Sugar Creek, Mo., to cost about $90,000. Missouri Electric Power Company, Dubuque, Iowa, plans hydro-electric power plant on Current River, near Doniphan, Mo., of 20,000 kw. capacity. Kansas Gas & Electric Company, Wichita, Kan., plans multi-story service and operating plant to cost $400,000. United Light & Power Corporation, Abiline, Kan., plans power plant at Manhattan, Kan. Purchasing Officer, Quartermaster Corps, Field Artillery School, Fort Sill,

Okla., will receive bids until April 9 for wire, switches and other electrical supplies (Circular 70). Paragould, Ark., has surveys under way for municipal light and power plant to cost $175,000. Port Arthur, Tex., contemplates a municipal electric light and power plant. Louisiana Power & Light Company, New Orleans, La., plans extensions in lines at Ferriday, La. Sewerage & Water Board, New Orleans, La., will receive bids until April 30 for a 700 to 800-kw. Diesel engine-electric unit for station "C."

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EASTERN

—HEAVIER COMMITMENTS AND INCREASED VOLUME *of inquiries are bringing marked improvement in the electrical equipment markets at New York and Philadelphia. Railroad purchases for electrification programs are giving a spur to the situation.*

—INDUSTRIAL BUYING *is reaching a more encouraging status and indications for sales in April are better than for several months past. Central stations are continuing to contract for miscellaneous equipment, primarily for substation and line service.*

A feature of the week is the business placed by the Reading Company, Philadelphia, for equipment requirements for electrification in that district, totaling $2,000,000. Multiple car units, transformers and circuit breakers, with accessories, will be furnished by the General Electric Company; similar equipment, including controls, etc., will be supplied by the Westinghouse Electric & Manufacturing Company, while the American Brown Boveri Company has secured a contract for multiple control car apparatus and affiliated equipment. The Delaware, Lackawanna & Western Railroad Company, New York, estimates its gross 1930 expenditures for electrification of suburban lines at $15,000,000, and further early commitments for equipment are anticipated.

In the industrial market the Ford Motor Company has ordered switchboard and other electrical apparatus from a New York manufacturer amounting to $35,000 and $25,000, in two contracts, for new plant at Edgewater, N. J. The International Graphite & Electrode Corporation, Niagara Falls, N. Y., has given an award to a state maker for transformers and auxiliary equipment for a new local plant, totaling $35,000. The Carpenter Steel Company, Reading, Pa., will electrify its merchant bar mills and has purchased two 1,000-kw. motor-generator sets, six heavy-duty motors, switching and control apparatus from the Westinghouse Electric & Manufacturing Company.

Central station account is expected to show higher totals during April, with present inquiries pointing to reasonably brisk buying. A metropolitan power company has ordered a quantity of transformers from a state maker to cost $40,000. A Missouri manufacturer will furnish a Diesel engine generating set for a municipal power station in Oregon. The Niagara Hudson Power Corporation, Buffalo, N. Y., has announced a 1930 construction program to cost $39,000,000, including both steam-electric and hydro-electric power expansion.

CONSTRUCTION PROJECTS

Rockland Light & Power Company, Nyack, N. Y., plans hydro-electric power plant on Delaware River, near Port Jervis, to cost $2,000,000. Empire Gas & Electric Company, Geneva, N. Y., plans extensions in hydro-electric power plant at Seneca Mills, and will rebuild transmission line from Phelps to Clifton Springs. Quartermaster Supply Officer, Brooklyn, N. Y., will receive bids until April 21 for a 15-kw. generator set, switchboard, etc. Public Service Electric & Gas Company, Newark, N. J., will build a power substation at Bayway, Elizabeth, to cost $475,000, and a similar station at Keasbey, N. J., to cost $200,000. Susquehanna Collieries Company, Sunbury, Pa., plans extensions and improvements in collieries, including installation of power equipment, to cost over $100,000. Washington Railway & Electric Company, Washington, D. C., plans automobile service and repair plant to cost $400,000. Bureau of Supplies and Accounts, Washington, D. C., will receive bids until April 8 for one Diesel engine power plant for submarine chasers (Schedule 3097); also, until April 15, for one electric plant, with automatic gas engine, for Casper, Wyo. (Schedule 3105.)

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SOUTHEAST

—GENERAL CONDITIONS CONTINUE *to improve in the Southeast and last week was a very satisfactory one in the electrical field.*

Building permits in Atlanta for March were slightly in excess of $2,114,318. From the New Orleans district was received an underground cable order amounting to approximately $30,000 and a $25,000 oil circuit breaker order was placed in Georgia. One of the larger companies' meter purchases last week aggregated $20,500, while its distribution and small power transformer orders totaled $14,000. A municipal plant in Mississippi ordered a 2,500-kw. turbine The most interesting industrial order was from Alabama for a 100,000-c.p.m. turbo blower. A cotton mill electrification in middle Georgia was responsible for a motor order approximating $35,000, while a lumber mill in Louisiana ordered motors to the extent of $6,000. One jobber in the territory reports the receipt of an order for a centralized radio system and 350 ceiling fans for a hotel installation out of the territory, this order approximating $15,000. An Atlanta contractor placed an order for $6,500 in lighting fixtures and $3,000 in supplies for the new post office at Memphis, Tenn.

CONSTRUCTION PROJECTS

Virginia Public Service Company, Charlottesville, Va., plans extensions in transmission lines at Green Bay, Boston and vicinity. Memphis Cold Storage Company, Memphis, Tenn., plans addition to cold storage and refrigerating plant to cost about $50,000. Durham Coca-Cola Company, Durham, N. C., has plans for a bottling plant to cost $100,000.

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MIDDLE WEST

—SLIGHT CHANGES IN GENERAL BUSINESS *in the Middle West section were noticeable the last week in March. The volume of business increased somewhat and favorable indications are more numerous than before. Increased car loadings are looked upon as another favorable indication. Retail business is receiving some added stimulus from spring and employment is somewhat greater.*

The various utility companies are busy with spring construction and rehabilitation work, one large utility company installing 270,000 lb. of weatherproof wire this month. Some of the interesting orders placed this week include auxiliary drive equipment to cost $155,000, three 500-kva., 12,000-volt, oil-insulated, water-cooled transformers and several construction orders aggregating $100,000.

Jobbers' sales are relatively good. Considerable spottiness is in evidence, but sales are holding up fairly well. Railroad business still continues to be one of the principal sources of revenue. Most appliances are moving in fair volume with a particularly good demand for waffle irons and toasters.

CONSTRUCTION PROJECTS

Two Rivers, Wis., plans municipal power plant to cost $100,000. Harnischfeger Corporation, Milwaukee, Wis., plans addition to heavy machinery plant to cost $200,000. Michigan Paper Corporation, Plainwell, Mich., plans extensions in power plant to cost $200,000. Wyandotte, Mich., plans extensions and improvements in municipal power plant to cost $250,000. State Hospital, Elgin, Ill., plans power plant to cost over $100,000. Department of Public Welfare, Columbus, Ohio, will soon take bids for power plant at Longview State Hospital, Cincinnati, to cost $240,000. Hamilton, Ohio, plans addition to municipal electric power station to cost $70,000. Okay Manufacturing Company, Columbus, Ohio, plans machine works to cost about $100,000.

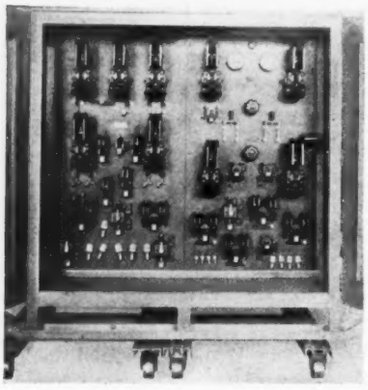
Devils Lake, N. D., plans ornamental lighting system. Minnesota Power & Light Company, Duluth, Minn., plans steam-operated electric power plant to cost $3,000,000. Detroit Lakes, Minn., plans underground conduit system in business district.

New Equipment Available

Variable Voltage Drilling Equipment

GREATER FLEXIBILITY of control, increased drilling speed and adaptability, both electrically and mechanically, to widely varying operating conditions are obtained with a new direct-current variable-voltage drilling equipment announced by the Westinghouse Electric & Manufacturing Company.

This equipment comprises two 125-



kw., 125-volt d.c. generators with direct-connected exciters supplying power to a separately excited 125-hp. mud-pump motor and a complete control. During drilling operations one generator supplies power to the mud pumps and the other generator supplies power to the drilling motor. In hoisting, the two generators are placed in series to give combined power of the generators and double speed on the drilling motor for fast hoisting operations. The control is arranged so that either generator can be used for either the mud pump or the drilling motor. Operation of the control can be obtained by means of the telegraph cord connecting the master switch with the control wheel on the draw-works post. Suitable pushbuttons for magnetic operations are also placed on the draw-works post.

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A NEW REFRACTING GLASS COVER with which the Benjamin pit-lighting unit is now furnished as standard has been announced by the Benjamin Electric Manufacturing Company, Des Plaines, Ill. With the refracting glass cover the pit-lighting unit may be installed with a very slight recess in the wall of a solid pit construction and good results can be secured by mounting with the face of the cast-iron body or housing flush with the face of the pit wall. The unit is especially adapted for the lighting of automobile greasing pits, railway and traction line repair shop pits, wash racks, hydraulic lights, viaducts, tunnels and similar locations.

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Switching Equipment for A. C. Generators

A NEW DEVELOPMENT IN AUTOMATIC switching equipment for use with a.c. generators direct connected to gasoline engines, used as an emergency power source, has been announced by the General Electric Company. Either single- or double-unit equipments are available. An automotive starting unit is provided for the engine and is energized from a storage battery which is kept charged by means of a "Tungar" rectifier connected to the a.c. source. Therefore when the indication is given of the failure of the normal a.c. power supply the engine starts automatically and the generator is then connected to supply emergency power.

Upon return of power to the preferred source the ignition system of the engine is interrupted to shut down the unit and the preferred line breaker is reclosed, restoring normal operation. Standard protective features are also included.

If overcurrent occurs on either of the generator lines the corresponding breaker will be tripped and locked out. It must be reclosed manually.

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Measures Stresses in Electrostatic Field

THE BERRY INSULATOR grading device, which measures the comparative stresses existing between the dynamic voltage and the counter-emf. of the electrostatic field, has been announced by the T. D. Berry Company, Ltd., Markdale, Ont., Canada. This instrument has an added value in informing the operating engineer of the distribution of the dielectric field around the insulator or insulator string. If this field is so distorted that it appreciably lowers the flashover value of the string it can be rectified by the use of grading rings or condenser plates.

The megohmeter must be used on a dead line, while the Berry insulator grading device is primarily a live line instrument, and instead of using a relatively small impressed voltage, this device is used under normal operating voltages without in any way disturbing or upsetting the insulating values of the unit or units under test. It consists of a small portable radio equipment and a testing head equipped with telescopic handles.

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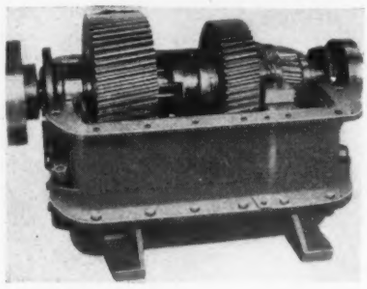
Stoker Gear Unit Has Two Speeds

PROVISION FOR OPERATION at two different speeds is a feature of a Westinghouse-Nuttall double-reduction gear unit for stoker drive. Timken bearings are used throughout except for the floating gears. Helical gears are used exclusively and are made from forged steel



and heat treated. Gears and bearings are lubricated by a positive splash system, the intermediate gear and a disk at the opposite end of the lower shaft carrying the oil from the reservoir in the bottom section of the case.

These units have a ratio of 5.88 to 1 in the high-speed and 12 to 1 in the low-speed and are used with 12-hp. motors operating at 600-900 r.p.m. for slow-speed service and 1,200-1,800 r.p.m. in high-speed service. One unit drives four stokers.

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Control Station for Airport Lights

A CENTRAL CONTROL STATION for the control of airport lights is announced by the General Electric Company. By means of this station the various lighting equipments of an airport can be operated from a central point, thus eliminating the necessity of locating the lighting control at a point where the various lights themselves are visible to an observer.

The control panel may be placed on a wall, on a table or desk or on a special pedestal. The indicating lights are protected from damage by compound shields and each light is wired in the actual circuit controlled, providing an actual indication of the condition of that circuit, according to the manufacturer.